

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

VOITH PAPER GMBH & CO. KG.,)	
)	
Plaintiff)	
)	
v.)	Civil Action No. 07-226 (JJF)
)	
JOHNSONFOILS, INC.,)	
)	
Defendant)	

PLAINTIFF VOITH PAPER GMBH & CO. KG'S OPENING MARKMAN BRIEF

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I. STATEMENT OF NATURE AND STAGE OF PROCEEDINGS

The parties are still conducting factual discovery. Exchange and completion of contention interrogatories, identification of fact witnesses and document production are to be completed by February 15, 2008. The following motions are presently pending before the Court: (1) Defendant's Motion To Stay The Proceedings Pending Reexamination Of The Patents In Suit Or In The Alternative For Leave To File A Motion For Summary Judgment Prior To August 20, 2008 That U.S. Patents 5,718,805 And 5,972,168 Are Invalid; (2) Voith Paper GMBH & Co. Kg's Motion To Compel Defendant JohnsonFoils, Inc. To Provide Information Requested In Voith's First And Second Sets Of Interrogatories And To Produce Documents Responsive To Voith's First And Second Requests For Documents; (3) Plaintiff Voith Paper GMBH & Co. Kg's Motion For A Protective Order Pursuant To Federal Rules Of Civil Procedure 26(c) Prohibiting The Disclosure Of Voith's Highly Confidential Information To Individuals Engaged In Competitive Business Practices For Or On Behalf Of Voith's Competitor JohnsonFoils, Inc.; (4) Defendant JohnsonFoils, Inc.'s Motion To Compel Production Of Documents In Response To Its First Set Of Document Requests And Rule 7.1.1 Statement; and (5) Defendant JohnsonFoils, Inc.'s Motion For Leave To Amend Its Counterclaims. A Markman Hearing is scheduled for January 30, 2008 at 10:00 a.m.

In a letter dated December 18, 2007, Voith's counsel proposed that each side submit an opening Markman brief, an opposition, and a reply, and invited JohnsonFoil's counsel to discuss a briefing schedule. JohnsonFoil's counsel responded in a letter dated December 19, 2007, that it was too late to agree to a briefing schedule, and that the parties were to simultaneously exchange briefs on January 16, 2008. Voith's counsel disagreed and in a letter dated December 20, 2007, again requested JohnsonFoil's counsel to agree to a briefing schedule:

I disagree with your statement that it is too late for us to agree to a Markman briefing schedule.

I also disagree with you that the date set for simultaneous exchange of Markman briefs is January 16, 2008. The Scheduling Order states that the Markman briefing is to be completed 10 days prior to the January 30, 2008, hearing. While the Scheduling Order does not expressly set dates for filing initial briefs, oppositions, and replies, it does not preclude the filing of such responsive pleadings, otherwise called for under Del. Local Rule 7.1.2. Consequently, a brief filed without providing any time for the opposing party to file an opposition by January 16, does not comply with the Scheduling Order. Thus, the parties must either file their opening briefs so as to permit the filing of an opposition by January 16, or, as we have proposed, ask the Court to modify the Scheduling Order to permit the parties to file their opposition briefs after January 16. To that end, we propose that the parties agree to submit their respective opening Markman briefs on January 14, and jointly request leave for each party to file a responsive brief by January 22.

JohnsonFoil's counsel, in a letter dated December 21, 2007, restated that they believed that simultaneously briefs were due on January 16, 2008, and clearly stated that they were "not interested in agreeing to a different briefing schedule."

Additionally, in its December 20 letter, Voith identified terms which might benefit from construction, and requested JohnsonFoil's to identify any other terms which might benefit from construction. Prior to submitting its Markman brief, JohnsonFoil's did not identify any additional terms.

II. SUMMARY OF THE ARGUMENT

The claims of U.S. Patent Nos. 5,718,805 ("the '805 patent")¹ and 5,972,168 ("the '168 patent")² (collectively "the Patents-in-suit") recite elements configured within a twin-wire former which were new and unobvious. Each element recited in the claims should be construed using its ordinary and accustomed meaning, *i.e.*, how the elements would have been understood by one

¹ A copy of the '805 patent is attached as Exhibit 1.

² A copy of the '168 patent is attached as Exhibit 2.

of ordinary skill in the art in view of the claims themselves, the patent specification, the prosecution histories,³ and extrinsic evidence.

III. BACKGROUND

A. PAPER MAKING MACHINES

A paper making machine is a machine used to manufacture paper. Paper making machines are very large and expensive. Today, a typical paper machine is longer than a football field. The cost of a complete paper making machine installation can exceed \$500 million dollars. Although paper making machines have a long history, the industry has yet to develop theoretical models which fully explain the paper forming process. Consequently, the paper making field is largely an empirical science in which innovations—even if resulting from novel rearrangements of mechanical paper forming components previously known—must be subject to extensive testing before achieving the status of an acceptable design. Declaration of Michael H. Waller In Support Of Plaintiff Paper GMBH & Co. KG’S Opening Markman Brief (“Waller Dec.”) ¶¶ 9-10.

The inventions of the Patents-in-suit relate to a section of the paper making machine especially critical to paper formation commonly known as the “wet end.” In the wet end, a fiber suspension made up of small fibers, mixed with water and other additives, is dewatered through a wire or fabric mesh to form a web. Mechanical elements such as rolls, shoes, and blades, contact the mesh and facilitate the forming process. As water is drained from this fiber suspension through the mesh, fibers are pulled to the mesh surface in the direction of the draining water, forming a *web* consisting of the partially matted fibers and the remaining fiber

³ A copy of the prosecution history of the ‘805 patent is attached as Exhibit 3 and a copy of the prosecution history of the ‘168 patent is attached as Exhibit 4.

suspension. After wet end dewatering, the web is transferred to other parts of the paper making machine for pressing, drying, and finishing. Waller Dec. ¶¶ 11-13.

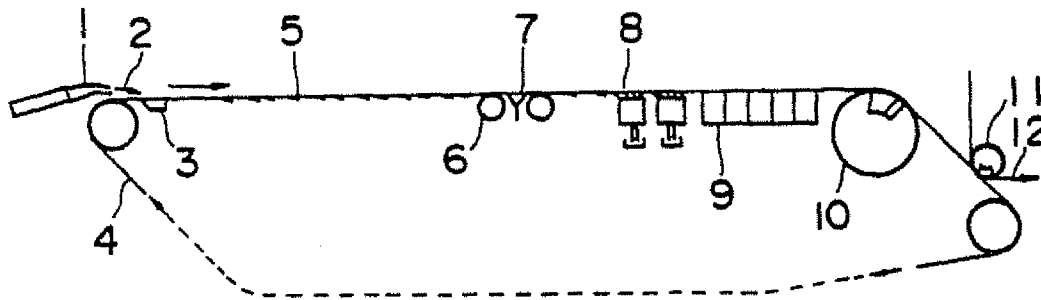
The basic idea of dewatering a fiber suspension to form a web or sheet sounds simple enough, but, in practice, this simply stated process requires the solution of problems of immense complexity. First, before even being applied to the wire mesh, the fiber suspension, typically 99% water, must be maintained in a very turbulent state to ensure uniformity. This fiber suspension, even though mostly composed of water, typically contains *hundreds of thousands* of fibers per cubic inch. The primary processing job of the wet end is to drain this fiber suspension *uniformly*, that is, without undesirable patterns or imperfections. Complicating matters, the suspended fibers have a strong tendency to bind together to form undesirable clumps called “flocs.” In a typical fiber suspension, such flocs form in a matter of milliseconds. Once formed, these flocs are very difficult to break apart, with the difficulty increasing by orders of magnitude as the amount of water remaining in the fiber suspension is reduced. Because this phenomenon, called flocculation, cannot be completely eliminated, measures must be taken to reduce the impact of flocs on the final product by breaking the flocs apart—a process called defloccing—as they form. Thus, to obtain a high quality product, the wet end part of the paper former must, simultaneously, uniformly dewater the fiber suspension and agitate the remaining fiber suspension to reduce flocculation. Waller Dec. ¶¶ 14-18.

There are three basic types of wet end forming sections used in paper forming machines: The Fourdrinier, the Twin Wire Former, and the Hybrid Former. These basic wet end paper forming machine types are distinguished by the number and position of wire meshes used to dewater the fiber suspension. The Fourdrinier uses a single mesh. The Twin Wire Former uses two meshes, with one positioned on each side of the web. Finally, the Hybrid former primarily

consists of a single mesh, with another mesh positioned on the top side of the web for a portion of the wet end. Waller Dec. ¶¶ 19-22. These basic types of wet end paper forming configurations are described in more detail below.

The Fourdrinier, shown in the Figure below (Figure 4 from U.S. Patent No. 4,999,087, Exhibit 5), utilizes a single horizontally oriented and continuously moving wire mesh.

F I G. 4(PRIOR ART)

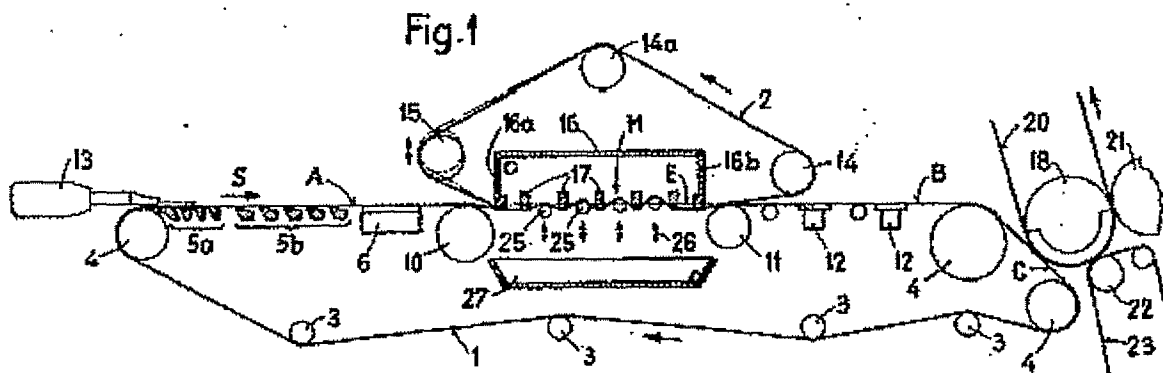


(Figure 4 from U.S. Patent No. 4,999,087)

As shown in the above Figure, a jet of fiber suspension is discharged from a container, called a headbox, onto the surface of the mesh. Water is removed from the fiber suspension through the mesh below by the force of gravity assisted by the action of strips, rolls and/or vacuum boxes. Although adequate for many applications and benefitting from its relative simple design compared to the alternatives, dewatering the fiber suspension from one side only results in a web with different surface characteristics on each side – called *two-sidedness*. These differences render the resulting web unsuitable for applications in which the uniformity of both sides of the paper is important. In addition, dewatering from one side necessarily requires that the web formation process take longer than in paper formers able to simultaneously dewater the fiber

suspension from both sides of the web. As explained above, with each passing second undesirable flocs form. To make matters worse, the single wire drainage model of the Fourdrinier provided limited opportunity to agitate and defloc the fiber suspension during web formation. Waller Dec. ¶¶ 23-28.

For applications in which the Fourdrinier's problems of flocculation and web two-sidedness were unacceptable, a modified Fourdrinier design, called a Hybrid former, as shown in the Figure below (Figure 1 from DE 3138133 A1, Exhibit 6), was developed.



(Figure 1 from DE 3138133 A1)

In a Hybrid former, as in the Fourdrinier, the fiber suspension is discharged onto a single wire mesh and is dewatered through the action of gravity in conjunction with various strips, rolls, and vacuum boxes. Unlike the Fourdrinier, however, the Hybrid former has a region in which a second wire mesh, attached to a component called a top former, is positioned above the web. In the part of the wet end containing the top former, the web is simultaneously dewatered from above and from below. As a result, the time needed for dewatering, as well as the two-sidedness of the web, are reduced to some extent. Waller Dec. ¶¶ 29-31.

In a Twin Wire Former, the entire web formation process is performed by simultaneously dewatering the fiber suspension from both sides. As shown in the Figure below (Figure 1 from

U.S. Patent No. 4,609,435, Exhibit 7), in a Twin Wire Former the entire wet end forming region is bounded above and below by a wire mesh.

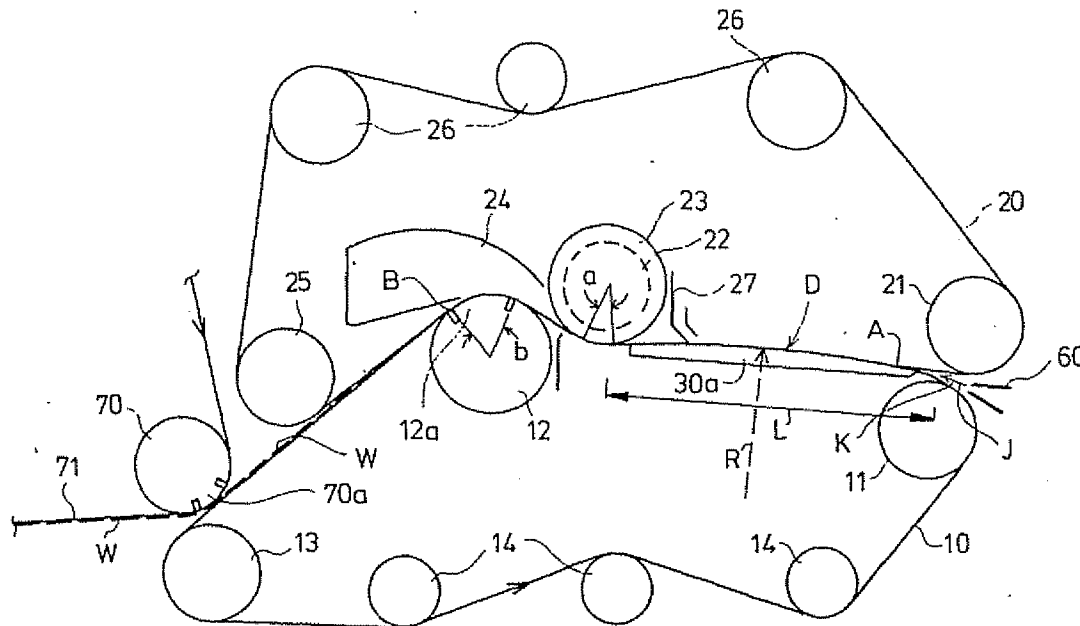


FIG. 1

(Figure 1 from U.S. Patent No. 4,609,435)

As a result, the time needed to dewater the web, as well as two-sidedness, is reduced yet further from the levels possible with either the Fourdrinier or the Hybrid Former. On the down side, because of the absence of a single wire predrainage zone, the Twin Wire Former subjects the forming web to high stress at the very beginning of web formation, risking damage to the web. Waller Dec. ¶¶ 32-34.

Despite the comparative reduction in web formation time, flocculation, and sheet two-sidedness over the Fourdrinier and the Hybrid Former, these problems persisted. As the demands on paper forming machines, such as increased production speed and quality, increased,

once widely adopted paper forming machine designs became unacceptable. Waller Dec. ¶¶ 35-36.

As disclosed in the Patents-in-suit:

[i]t has been attempted for decades with twin-wire formers of the known type to produce fiber webs (in particular, paper webs) of the highest possible quality with relatively high operating speeds. Due to the forming of the web between two wires, the result, in particular, is obtained that the final fiber web has substantially the same properties on both sides (little “two-sidedness”). However, it is difficult to obtain as uniform as possible a distribution of the fibers in the final fiber web.

‘805 patent, col. 1:45-53.

The Patents-in-suit further disclose that it had been

difficult to obtain a good ‘formation’ since while the web is formed, there is always the danger that fibers will agglomerate and form flocculations. Therefore, it is attempted to form a jet of pulp slurry which pulp slurry is as free as possible of flocculations in the headbox (for instance, by means of a turbulence producer). It is, furthermore, endeavored so to influence the drainage of the fiber suspension during the web-forming that ‘reflocculation’ is avoided as far as possible or that, after possible flocculation, a ‘deflocculation’ (*i.e.*, a breaking up of the flocculations) takes place.

‘805 patent, col. 1:53-63.

As described in detail below, the invention claimed in the Patents-in-suit dramatically addresses this pressing need with a novel combination of elements.

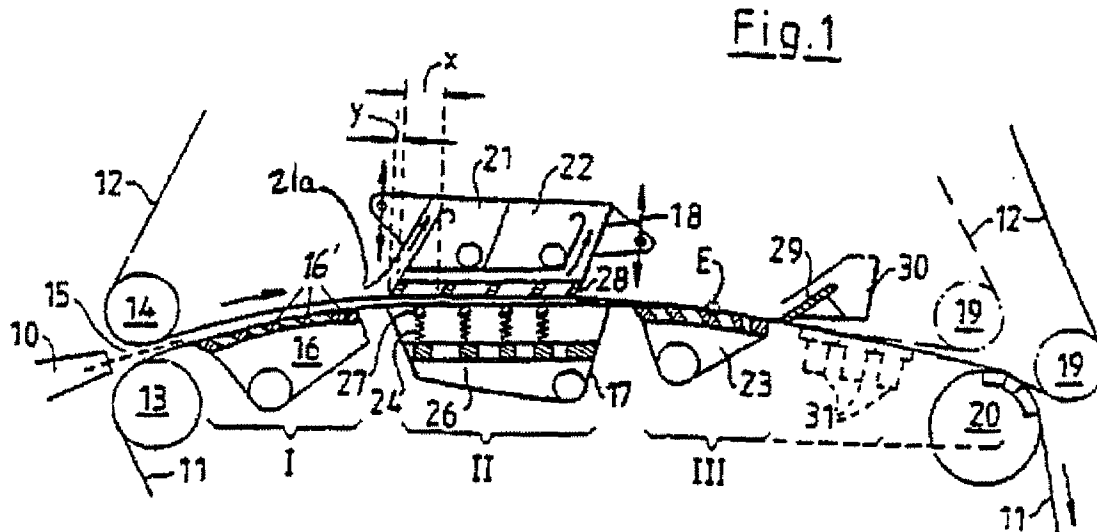
B. THE INVENTION

To address the aforementioned problems in prior art Twin Wire Formers—problems that had persisted in the paper making industry for decades—Voith invented a novel Twin Wire Former that dramatically reduces the incidence of flocs in the web during formation as well as undesirable web two-sidedness, even under the demands of modern production quality and speed requirements. As disclosed in the Patents-in-suit, among other innovations, Voith discovered that introducing resiliently mounted strips, or blades, in the claimed configuration, effectively

reduced flocculation while, at the same time, maintaining relatively constant pressure in the fiber suspension and, thereby, facilitating proper web formation. This innovation was accomplished despite the failure of others in the paper making industry to discover Voith's novel combination, and despite the long felt need to improve Twin Wire Formers. Voith's invention is all the more remarkable considering that the dramatic improvement was achieved using components which, though employed in disparate paper forming applications, were never, before the teachings of the Patents-in-suit, known to achieve, in combination, the long sought improvements. Waller Dec. ¶¶ 39-42. A more detailed description of Voith's invention as described in the Patents-in-suit follows.

As with Twin Wire Formers generally, Voith's novel Twin Wire Former utilizes two opposing wire meshes to form a web from a fiber suspension. The "wires" referred to in the Patents-in-suit are actually mesh belts, usually made of fabric. During web formation, each mesh travels in an endless, *i.e.*, closed, loop. At the beginning of, or entrance to, the twin-wire zone, the two wire meshes form a wedge shaped entrance slot. A headbox is used to discharge the fiber suspension, also referred to as "pulp slurry" or "stock," into the twin wire zone. Prior to discharge, the headbox maintains the fiber suspension in a turbulent state in order to inhibit flocculation. The fiber suspension is discharged from the headbox onto the wire meshes into the wedge shaped slot. The two wire meshes thereafter travel together through the twin wire forming zone. Waller Dec. ¶¶ 43-45.

Fig. 1 of the '805 patent (and '168 patent), reproduced below, shows an embodiment of components, described in more detail below, which further comprise the invention.



To form the web, water is removed from the fiber suspension as it travels between and along the path of the wires. As water is removed through the two meshes, fibers collect in a mat against each mesh, leaving a relatively liquid fiber suspension center. Because this liquid center persists during much of the web formation process, it is a fertile ground for the formation of undesirable flocs, which, as explained above, may take only milliseconds to form. An important aspect of the invention is to maintain turbulence in this liquid center of the forming web while reducing the risk that the partially formed web is broken. As described in more detail below, a specific combination of resiliently mounted and rigidly mounted strips or blades contributes to accomplishing this result. At the end of the twin wire zone, the opposing twin wire meshes separate and one of the meshes carries the formed web through the next processing component of the paper making machine for pressing, drying, and finishing. Waller Dec. ¶¶ 46-50.

To practice the invention, the twin wire formers claimed in the patents-in-suit are constrained to include at least some drainage and forming elements positioned relative to one

another in a specified way. Unlike the Hybrid former and the Fourdrinier described above, the invention precludes the use of a single-wire pre-drainage zone. As explained above, any substantial single wire predrainage is likely to result in undesirable web two-sidedness and increased flocculation. Thus, another important aspect of the invention is that the web formation begins in the twin-wire zone. Waller Dec. ¶ 51.

To illustrate how the above described aspects of the invention are realized, the following provides a more detailed description of a preferred embodiment. As described above, in the beginning of the twin-wire zone, the fiber suspension is discharged from the headbox⁴ onto the two wire meshes at the wedge shaped entrance slot. At least one of the wire meshes passes over at least one drainage element in order to partially dewater the fiber suspension and begin the formation of the web. In a preferred embodiment, this drainage element is curved, *e.g.*, a rotating forming cylinder or a (stationary) curved forming shoe. Additional drainage elements may also be present in the beginning of the twin-wire zone. Waller Dec. ¶¶ 52-54.

Following the wedge shaped entrance slot and initial drainage element(s), the invention includes a plurality of drainage strips (blades) that contact each wire mesh in an offset non-opposing relationship. These blades contact the wire mesh at points along the mesh path that are different from any blade in contact with an opposite wire mesh. The drainage strips (blades) further remove water from the web by stripping water from the surface of the passing wire mesh. In addition to providing intensive drainage, these blades also inhibit the formation of flocs in the liquid center of the partially formed web. This is achieved by imparting a slight deflection of the wires so that turbulence is constantly produced in the still liquid part of the web. '805 patent, col. 5:19-24. Importantly, drainage strips (blades) on one side of the wire meshes are resiliently

⁴ As previously explained, the headbox maintains the stock in a turbulent condition prior to application to the wires.

supported while drainage strips (blades) on the other side are rigidly supported. As described in the specification, the use of resiliently supported blades allows for the blade to temporarily move in response to changes in pressure of the fiber suspension, thus maintaining a relatively constant forming pressure and avoiding undesirable damage to the partially formed web. '805 Patent, col. 7;16-21; Waller Dec. ¶¶ 55-57.

As explained in the patent:

Due to the resilient supporting of the lower strips 57, the adjustment, once effected, is insensitive to changes in the quantity or quality of pulp, so that no backing up takes place in front of the strips and, nevertheless, an effective introduction of turbulence forces into the fiber suspension takes place.

Id. The actual number of drainage strips on each side of the wires can be varied. '805 patent, col. 7:60-65; *see also* Figs. 1-5, elements 27, 28, 50, 57, 58. Waller Dec. ¶¶ 58-59.

After the drainage strips there may be one or more additional drainage elements. *See* Figs. 1-5, elements 23, 29, 31, 45. Waller Dec. ¶ 60.

As explained in the Patents-in-suit, a paper making machine containing at least the elements as claimed produces improved quality paper, *i.e.*, with reduced flocculation, and at desirably high speed. Waller Dec. ¶ 61.

During the prosecution of U.S. Patent No. 5,389,206, a grandparent of the '805 patent, the applicants explained that the elements which make up the invention were known in the prior art, and that it was the claimed combination of elements which was new and patentable:

applicants are not claiming that any of the specific features are new. What applicants are claiming however is that they are the first to have combined these features ... and that such combination provide unforeseeable improvements in the resultant product, to wit, the combination ... results in extremely high increase in quality of the finished fiber web while at the same time being insensitive to changes in the amount of suspension fed and to changes in the drainage behavior of the fiber suspension. Thus it is possible to obtain both a high increase in quality with respect to the

formation and also good values with regard to the retention of fillers and fines.

'206 patent prosecution history, Amendment dated November 19, 1992, p. 5. Exhibit 8. Waller Dec. ¶ 62.

The patents-in-suit also disclose that the invention relates to a combination of known features:

The inventors have found that a combination of known features, namely:

- A. Twin-wire former without a single-wire pre-drainage zone or at least without a single-wire pre-drainage zone of any substantial length such as to cause any appreciable pre-drainage
- B. Start of the drainage in the twin-wire zone at a preferably curved drainage element, for instance on a rotating forming cylinder or, even better, on a curved stationary forming shoe
- C. Further drainage in the twin-wire zone between strips which are arranged along a "zig-zag" line, the strips which rest against the one wire belt being resiliently supported.

leads to an extremely high increase in the quality of the finished fiber web, so that it satisfies even the highest requirements.

'805 patent, col. 3:1-17. Waller Dec. ¶ 63.

As explained by the applicants, although each feature used in the claimed combination had been used in disparate paper forming applications, prior to the Voith's invention, despite intense pressure to improve the production quality and production speed of paper produced by Twin Formers over the course of decades, no one had discovered the claimed combination or its dramatic properties. *See, e.g.*, '805 patent, col. 1:45-63; 2:44-45. Waller Dec. ¶ 64.

C. THE PATENTS

U.S. Patent No. 5,718,805 is entitled "Twin wire former" and issued on February 17, 1998. The application which matured into the '805 patent was filed on November 2, 1995, and

claims the benefit of German Patent Application P 39 27 597.3 dated August 22, 1989. The inventors named on the '805 patent are Egelhof; Dieter (Heidenheim, DE), Henseler; Klaus (Heidenheim, DE), Kade; Werner (Neenah, WI), Meinecke; Albrecht (Heidenheim, DE), Wanke; Wilhelm (Heidenheim, DE), Wulz; Hans-Jurgen (Heidenheim, DE), and deceased Buck, Rudolf (late of Heidenheim, DE).

The '805 patent has a total of 5 claims, all of which are independent and directed to an apparatus. Each claim recites a twin-wire former for the production of a paper web from a fiber suspension with specific elements. For example, Claim 3 of the '805 patent is reproduced below:

3. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-

opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips;

second support means supporting the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone being free of rolls which deflect the twin wire zone.

U.S. Patent No. 5,972,168 is also entitled "Twin Wire Former" and issued on October 26, 1999. The '168 patent is a continuation of the '805 patent, and thus claims the same benefit of priority and names the same inventors.

The '168 patent has a total of 8 claims, 4 independent and 3 dependent. The patent contains both apparatus claim (see claims 3-4 and 7-8) and method claims (*see* claims 1-2 and 5-6). For example, the following is Claim 7 of the '168 patent:

7. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts which travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a stationary curved forming shoe at the start of the path of the wire belts through the twin wire zone; supports which support the wire

belts for forming a wedge shaped entrance slot into the first section;

a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

said stationary curved forming shoe having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the wire belts through the twin wire zone, the forming shoe being engaged by one of the wire belts and being arranged for curving the path of both wire belts around the forming shoe after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the wire belts through the twin wire zone; in the second section, a plurality of the first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belts; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; a first strip support which resiliently supports the first drainage strips against the first wire belt that the first strips contact;

a second strip support which supports the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a stationary drainage element followed by a suction roll in the third section, for being engaged by one of the wire belts as the wire belts travel over the stationary drainage element and said suction roll, the stationary drainage element and said suction roll having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone apart from said suction roll being free of rolls which deflect the twin wire zone.

The claimed paper making machine, and method for making paper, provide improved quality paper in a twin wire former.

IV. ARGUMENT

A. THE LAW OF CLAIM CONSTRUCTION

1. Ordinary and Accustomed Meaning to a Person of Ordinary Skill in the Art At the Time of the Invention.

When construing claim terms, “a court must presume that the terms in the claim mean what they say, and, unless otherwise compelled, give full effect to the ordinary and accustomed meaning of claim terms.” *Johnson Worldwide Assoc., Inc. v. Zebco Corp.*, 175 F.3d 985, 989 (Fed. Cir. 1999). *See also Izumi Products Co. v. Koninklijke Philips Electronics N.V.*, 140 Fed. Appx. 236, 245 (Fed. Cir. 2005) (“Claim terms are to be given their ordinary and customary meaning to one of skill in the relevant art.” (citing *Johnson Worldwide Assocs., Inc. v. Zebco Corp.*, 175 F.3d 985, 989 (Fed. Cir. 1999))); *see also PC Connector Solutions LLC v. SmartDisk Corp.*, 406 F.3d 1359, 1363 (Fed. Cir. 2005) (citing *Carroll Touch, Inc. v. Electro Mechanical Systems, Inc.*, 15 F.3d 1573, 1577 (Fed. Cir. 1993)). The ordinary and accustomed meaning “is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, *i.e.*, as of the effective filing date of the patent application.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc).

To ascertain the plain and ordinary meaning to one of skill in the art, the Court objectively reviews:

... those sources available to the public that show what a person of skill in the art would have understood disputed claim language to mean. Those sources include the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art.

Phillips, 415 F.3d at 1313. In other words, the claim terms are not viewed in a “vacuum”, but in the context of the specification and prosecution history. *See Medrad, Inc. v. MRI Devices Corp.*, 401 F.3d 1313, 1319 (Fed. Cir. 2005); *see also Markman v. Westview Instruments, Inc.*, 52 F.3d

967, 979 (Fed. Cir. 1995). While the claims are viewed in light of the specification, however, embodiments appearing in the written description will not be used to limit claim language that has broader effect. *Paymaster Technologies, Inc. v. U.S.*, 180 Fed. Appx. 942, 946 (Fed. Cir. 2006) (“It is axiomatic that claims are only rarely, if ever, construed as limited to the preferred embodiment.” (citing *Johnson Worldwide Assocs., Inc. v. Zebco Corp.*, 175 F.3d 985, 992 (Fed. Cir. 1999))); see also *Innova/Pure Water, Inc. v. Safari Water Filtrations Sys., Inc.*, 381 F.3d 1111, 1117 (Fed. Cir. 2004); see also *Electro Sci. Indus., Inc. v. Dynamic Details, Inc.*, 307 F.3d 1343, 1349 (Fed. Cir. 2002); see also *Laitram Corp. v. NEC Corp.*, 163 F.3d 1342, 1347-48 (Fed. Cir. 1998).

Importantly, the presumed ordinary meaning of a claim term will only be ‘rebutted if the inventor has disavowed or disclaimed scope of coverage, by using words or expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.’” *Gemstar-TV Guide International, Inc. v. International Trade Commission*, 383 F.3d 1352, 1364 (Fed. Cir. 2004); see also *Conoco, Inc. v. Energy & Environmental Intern., L.C.*, 460 F.3d 1349, 1357 (Fed. Cir. 2006) (“an inventor may use the specification to intentionally disclaim or disavow the broad scope of a claim . . . However, this intention must be clear.” (citing *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002) (“The patentee may demonstrate an intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.”))); see also *Innova/Pure Water, Inc.*, 381 F.3d at 1117 (noting claims are not to be read restrictively “unless the patentee has demonstrated a clear intention to limit the claim scope using words or expressions of manifest exclusion or restriction”).

Where, as here, related patents are involved, claim terms should be construed identically across the related patents. *Glaxo Group Ltd. v. Apotex, Inc.*, 376 F.3d 1339, 1347 (Fed. Cir. 2004). *See also Z4 Technologies, Inc. v. Microsoft Corp.*, 507 F.3d 1340, 1348 (Fed. Cir. 2007) (citing *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1334 (Fed.Cir.2003) (“[W]e presume, unless otherwise compelled, that the same claim term in the same patent or related patents carries the same construed meaning.”)); *see also Phonometrics, Inc. v. Northern Telecom Inc.*, 133 F.3d 1459, 1465 (Fed. Cir. 1998) (“A word or phrase used consistently throughout a claim should be interpreted consistently.”).

The patent claims must also be construed in light of the prosecution history, although it is recognized that the prosecution history “often lacks the clarity of the specification and thus is less useful for claim construction purposes.” *Phillips*, 415 F.3d at 1318. As with claim terms, where there are related patents, the statements made during the prosecution of one patent are relevant to the scope of all sibling patents. *Microsoft Corp. v. Multi-Tech Sys., Inc.*, 357 F.3d 1340, 1350 (Fed. Cir. 2004); *Laitram Corp. v. Morehouse Indus., Inc.*, 143 F.3d 1456, 1460 & n. 2 (Fed. Cir. 1998) (proper to consider for claim construction the prosecution histories of two related re-examination patents originating from same parent).

Claim construction of a means-plus-function limitation includes two steps. First, the court must determine the claimed function. *Applied Medical Resources Corp. v. United States Surgical Corp.*, 448 F.3d 1324, 1352 (Fed. Cir. 2006). Second, the court must identify the corresponding structure in the written description of the patent that performs that function. *Id.*

2. Definition of Person of Ordinary Skill in the Art.

For purposes of claim construction, a person of ordinary skill in the art as of 1989 was someone with an engineering degree and 1-3 years of experience working with paper making machines. Waller Dec. ¶ 95.

B. PROPOSED CLAIM CONSTRUCTION

In view of the language of the claims, the specification, the prosecution history and relevant extrinsic evidence, Voith introduces the ordinary and accustomed meaning of the claim terms as would have been understood by a person of ordinary skill in the art.

1. twin-wire former

A twin-wire former is a paper forming machine in which the web is formed between two moving “wires.” A twin wire former is distinguished from single wire formers and Hybrid formers. Waller Dec. ¶ 68.

2. wire

A wire in the context of a twin wire former is a mesh belt. The Patents-in-suit use the terms “wire” and “belt” together and interchangeably. *See* ‘805 patent, col 4:6-8, 17-18: “the two wire belts 11 and 12”; col. 4:39: “wire 12”; col. 4:55: “wire 11”; col. 2:63-67: “drainage strips against one belt are offset along the path of the wire belts with respect to the drainage strips against the other belt, providing a zig zag or staggered array, and the drainage strips against at least one of the belts are resiliently supported.”

Consistent with the specification of the Patents-in-suit, The Handbook of Pulp and Paper Terminology defines the term “wire” as an endless belt of woven wire cloth for the drainage of stock and forming a fiber web. *See* Gary A. Smook, *HANDBOOK OF PULP & PAPER*

TERMINOLOGY, 1990, p. 206. In current practice, few metallic wires are used, but the term is usually applied to synthetic forming fabrics. Waller Dec. ¶ 69.

3. web

A web is a partially dewatered fiber suspension. Consistent with the specification of the Patents-in-Suit, the Handbook of Pulp & Paper Terminology states that the term web is applied to the full width of the paper sheet in the process of being formed, pressed, dried, finished or converted. See Gary A. Smook, *HANDBOOK OF PULP & PAPER TERMINOLOGY*, 1990, p. 205. Waller Dec. ¶ 70.

4. fiber suspension

A fiber suspension is a mixture of pulp fiber, water and additives. The fiber suspension is also commonly referred to as “stock⁵” or “pulp slurry.” See ‘805 patent, col. 1:1-3; col. 1:27-28; col. 1:32-33. Consistent with the specification of the Patents-in-suit, the *Pulp & Paper Dictionary* defines “stock,” a synonym for fiber suspension, as the fibrous mixture in a paper mill which is ready to make into paper. John R. Lavigne, *Pulp & Paper Dictionary*, 1986, 1992, p. 413. The fiber suspension may consist of one or more types of beaten or refined pulps, with or without suitable fillers, dyes, additives, and other chemicals. *Id.* Waller Dec. ¶ 71.

5. means for directing the wire belts

The “means for directing the wire belts” is a means plus function limitation. The recited function is “directing the wire belts.” The structures disclosed in the specification which direct the wire belts include rolls, shoes, strips, and other structures which determine the path the belts

⁵ Stock: The fibrous mixture in a paper mill which is ready to make into paper. It may consist of one or more types of beaten or refined pulps, with or without suitable fillers, dyes, additives, and other chemicals. John R. Lavigne, *Pulp & Paper Dictionary*, 1986, 1992, p. 413.

travel. *See* '805 patent, Figs. 1-5. Waller Dec. ¶ 72. This limitation includes these disclosed structures and equivalents thereof. 35 U.S.C. § 112 ¶ 6.

6. twin wire zone

The twin wire zone is where web formation occurs in a twin wire former. Waller Dec. ¶ 73.

7. single wire predrainage zone

A single wire predrainage zone is the part of a single wire former or Hybrid former in which the web is partially formed initially only in a lower layer of the fiber suspension while the upper layer remains liquid. '805 patent, col. 3:44-48. The twin wire former claimed in the Patents-in-suit does not have a single wire predrainage zone. '805 patent, col. 3:3-6; col. 8:11-12 (describing the invention as a twin wire former with "neither wire belt defining a single wire predrainage zone"). Waller Dec. ¶ 74.

8. first section

The first forming section of a twin wire former is where web formation begins. Waller Dec. ¶ 75.

9. drainage element

An element which removes water from the fiber suspension or web. Examples of drainage elements disclosed in the specification include rolls, suction boxes, shoes and strips. *See, e.g.*, '805 patent, col. 3:7-10 ("Start of the drainage in the twin-wire zone at a preferably curved drainage element, for instance on a rotating forming cylinder or, even better, on a curved stationary forming shoe"); col. 5:16-18 ("two drainage boxes 17 and 18 with the alternately resiliently and firmly supported ledge strips 27 and 28."); col. 1:42-44 ("in a third section of the

twin-wire zone there are a plurality of stationary drainage elements developed as flat suction boxes.”). Waller Dec. ¶ 76.

10. means for supporting the belts for forming a wedge shaped entrance slot

This element is a means plus function limitation. The recited function of this limitation is “forming a wedge shaped entrance slot.” The structures disclosed in the specification for supporting the belts (wires) to form a wedge-shaped entrance slot are the two rolls at the start of the twin wire former. *See* ‘805 patent, Figs. 1-5; col. 4:4-6. Waller Dec. ¶ 77. This limitation includes these disclosed structures and equivalents thereof. 35 U.S.C. § 112 ¶ 6.

11. wedge shaped entrance slot

The wedge shaped entrance slot is the wedge-shaped area between the two wires at the start of the twin wire zone where the two wires approach each other. *See, e.g.* ‘805 patent, col. 4:1-6 (“The endless wire belts (lower wire 11 and upper wire 12), shown only in part, travel in the direct vicinity of a headbox 10 over, in each case, a breast roll 13 and 14 respectively, so that the two wire belts together form a wedge-shaped entry slot 15 at the start of the twin-wire zone.”); *see also* Figs. 1-5. Waller Dec. ¶ 78.

12. headbox

A container at the beginning of the twin wire former which discharges the fiber suspension onto the wires. *See, e.g.*, ‘805 patent, col. 1:29-32. Waller Dec. ¶ 79.

13. second section

The forming section after the first forming section of a twin wire former. Waller Dec. ¶ 80.

14. drainage strips

A drainage strip is a blade which contacts the wire. '805 patent, col. 4:20-28, 37-38 ("The strips scrape the water from the wires.") Waller Dec. ¶ 81.

15. offset and in a non-opposing relationship

Positioned so that the contact points of the blades on the wire do not oppose one another, *e.g.*, positioned in a zig-zag or staggered array. *See, e.g.*, '805 patent, col. 2:63-66. Waller Dec. ¶ 82.

16. support means for resiliently supporting

The "support means for resiliently supporting" is a means plus function limitation. The recited function is "resiliently supporting." Exemplary structures disclosed in the specification for resiliently supporting the blades are springs and pneumatic pressure cushions. *See, e.g.*, '805 patent, col. 4:19-26. Waller Dec. ¶ 83. This limitation includes these disclosed structures and equivalents thereof. 35 U.S.C. § 112 ¶ 6.

17. means for collecting the water

The "means for collecting the water" is a means plus function limitation. The recited function is "collecting water." The structures disclosed in the specification for collecting water include water-collection containers and channels. *See, e.g.*, '805 patent, col. 6:25-26 ("Further elements of the twin-wire former shown in Fig. 2 are water-collection containers 41, 42 and 43."); '805 patent col. 4:44-47 ("Accordingly, a vertical channel 21a is positioned in front of the first upper strip 28 to carry away or collect the water scraped off by the first strip 28"). Waller Dec. ¶ 84. This limitation includes these disclosed structures and equivalents thereof. 35 U.S.C. § 112 ¶ 6.

18. third section

The forming section after the second forming section of a twin wire former. Waller Dec. ¶ 85.

19. roll

A rotating, cylindrically shaped, solid or hollow structure. This definition is consistent with the specification and the understanding of one of skill in the art. *See* John R. Lavigne, *Pulp & Paper Dictionary*, 1986, 1992, pp. 372-73. Examples of rolls disclosed in the '805 patent specification are breast rolls (col. 4:4), guide rolls (col. 3:51, col. 5:12), suction rolls (col. 5:12), and forming rolls (col. 5:42). Waller Dec. ¶ 86.

20. endless loop

A continuous wire forming a closed loop. *See* '805 patent, Figs. 4 and 5 showing wire 12 in an endless loop. Waller Dec. ¶ 87.

21. means for supplying a vacuum

The "means for supplying a vacuum" is a means plus function limitation. The recited function is "supplying a vacuum." The structures disclosed in the specification for supplying a vacuum is a chamber which applies a vacuum. *See e.g.*, vacuum chamber 51. '805 patent, Fig. 4 and col. 6:53. Waller Dec. ¶ 88. This limitation includes these disclosed structures and equivalents thereof. 35 U.S.C. § 112 ¶ 6.

22. resiliently supported

The term "resiliently supported" means supported by flexible structures such as springs, pneumatic pressure cushions, or equivalent structures. The specification of the Patents-in-suit discloses that the resiliently supported strips are supported by springs or pneumatic pressure cushions. *See, e.g.*, '805 patent, col. 4:19-26; '805 patent, col. 7:6-8. Waller Dec. ¶ 89.

23. rigidly supported

The term “rigidly supported” means firmly or non-resiliently supported. This definition is consistent with the specification of the Patents-in-suit and the understanding of one of ordinary skill in the art. *See* ‘805 patent, col. 5:17-34. Waller Dec. ¶ 90.

24. dewatering element

The term “dewatering element” means an element which removes water. Waller Dec. ¶ 91.

25. suction roll

A roll which includes suction to remove water. *See, e.g.*, ‘805 patent, suction roll 20 in Fig. 1, col. 5:11-14. Waller Dec. ¶ 92.

26. forming roll

A forming roll is a roll used to form the web. The Patents-in-suit disclose that the forming roll may be a suction roll. *See, e.g.*, ‘805 patent, forming roll 40 in Fig. 2, col. 5:42; col. 6:20-21. Waller Dec. ¶ 93.

27. forming shoe

A stationary drainage element which removes water. *See, e.g.*, ‘805 patent, Fig. 1 (element 16), col. 3:8-10. The Patents-in-suit disclose that the forming shoe may be curved or straight. ‘805 patent, col. 4:13-15. Waller Dec. ¶ 94.

V. CONCLUSION

Plaintiff respectfully requests the Court to adopt the ordinary and accustomed meanings of the claim terms as set forth herein.

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CERTIFICATE OF SERVICE

I, Adam W. Poff, hereby certify that on January 16, 2008, I caused to be electronically filed a true and correct copy of the foregoing document with the Clerk of the Court using CM/ECF, which will send notification that such filing is available for viewing and downloading to the following counsel of record:

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Exhibit 1



US005718805A

United States Patent [19]**Egelhof et al.**[11] **Patent Number:** **5,718,805**[45] **Date of Patent:** ***Feb. 17, 1998**[54] **TWIN WIRE FORMER**

[75] **Inventors:** Dieter Egelhof; Klaus Henseler, both of Heidenheim, Germany; Werner Kade, Neenah, Wis.; Albrecht Meinecke, Heidenheim, Germany; Wilhelm Wanke, Heidenheim, Germany; Hans-Jurgen Wulz, Heidenheim, Germany; Rudolf Bück, deceased, late of Heidenheim, Germany, by Else Bück, legal representative

[73] **Assignee:** J. M. Voith GmbH, Heidenheim, Germany

[*] **Notice:** The term of this patent shall not extend beyond the expiration date of Pat. No. 5,500,091.

[21] **Appl. No.:** 556,769

[22] **Filed:** Nov. 2, 1995

Related U.S. Application Data

[63] Continuation of Ser. No. 286,948, Aug. 8, 1994, Pat. No. 5,500,091, which is a continuation of Ser. No. 55,918, Apr. 29, 1993, Pat. No. 5,389,206, which is a continuation of Ser. No. 773,965, filed as PCT/EP90/01313, Sep. 8, 1990, abandoned.

[30] **Foreign Application Priority Data**

Aug. 22, 1989 [DE] Germany 39 27 597.3

[51] **Int. Cl.⁶** D21F 1/00

[52] **U.S. Cl.** 162/301; 162/300

[58] **Field of Search** 162/203, 300, 162/301, 303, 348, 352

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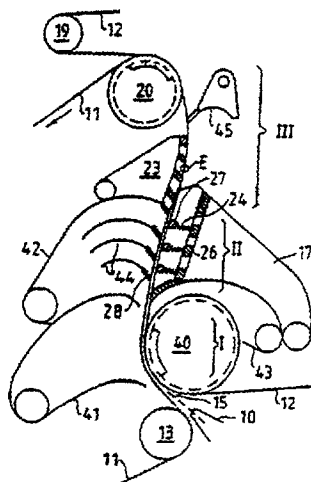
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Primary Examiner—Karen M. Hastings

Attorney, Agent, or Firm—Ostrolenk, Faber, Gerb & Soffen, LLP

[57] **ABSTRACT**

In a twin-wire former for the production of a paper web, two wire belts (11 and 12) together form a twin-wire zone which is divided into three sections (I, II and III). In the first section (I) the two wires (11, 12) travel over a curved forming shoe (16), or a forming roll (40). They form there a wedge-shaped inlet slot (15) with which a headbox (10) is directly associated. In the second section (II), several resiliently supported strips (27) rest against the lower wire (11) and between each of said strips (27) a rigidly mounted strip (28) rests against the upper wire (12). In the third section (III) both wire belts (11, 12) pass over another curved forming shoe (23).

5 Claims, 2 Drawing Sheets

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Sheet 1 of 2

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Fig.1

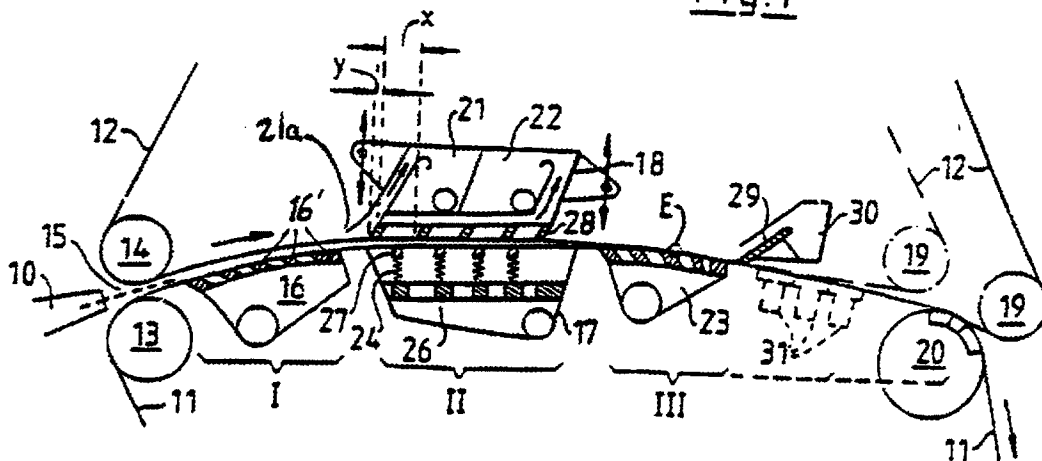


Fig.2

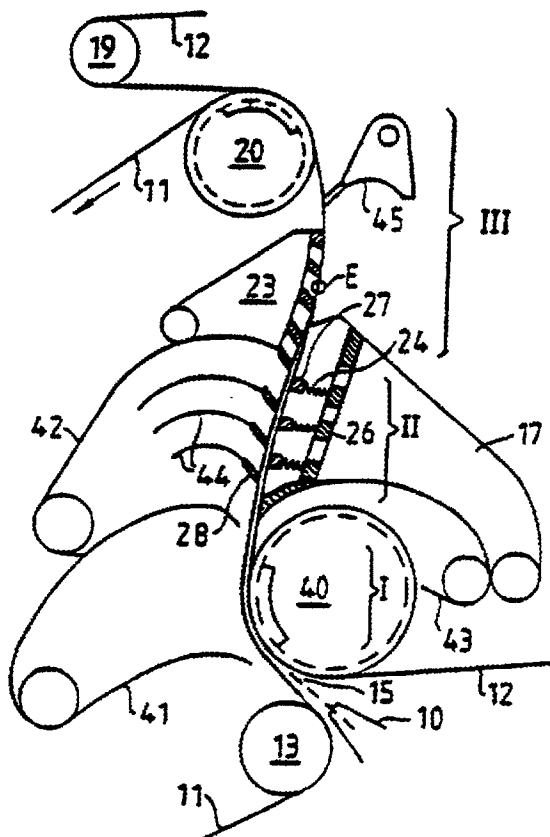


Fig.3

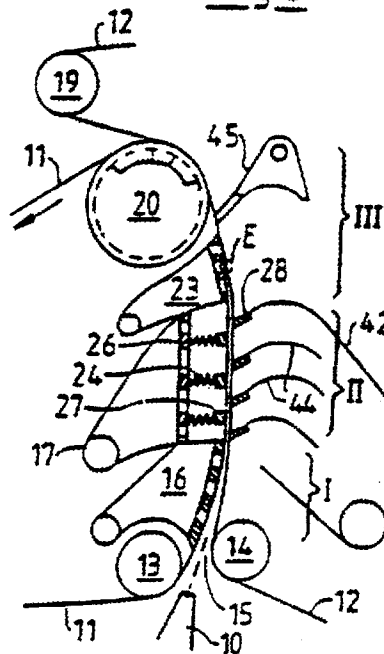


Fig.4

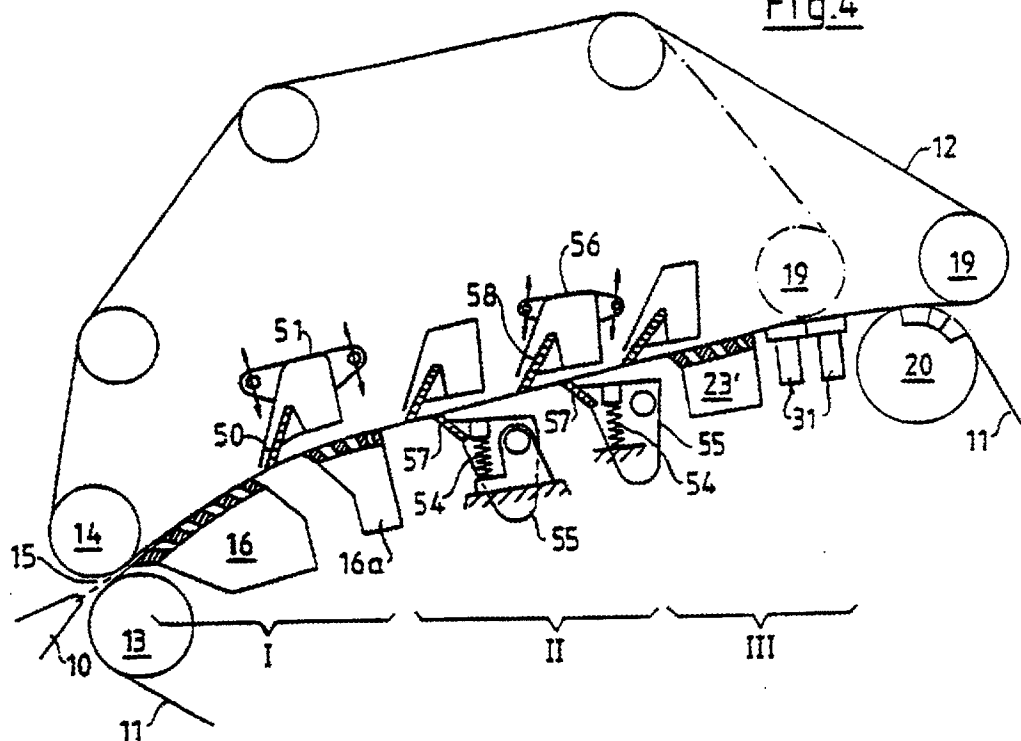
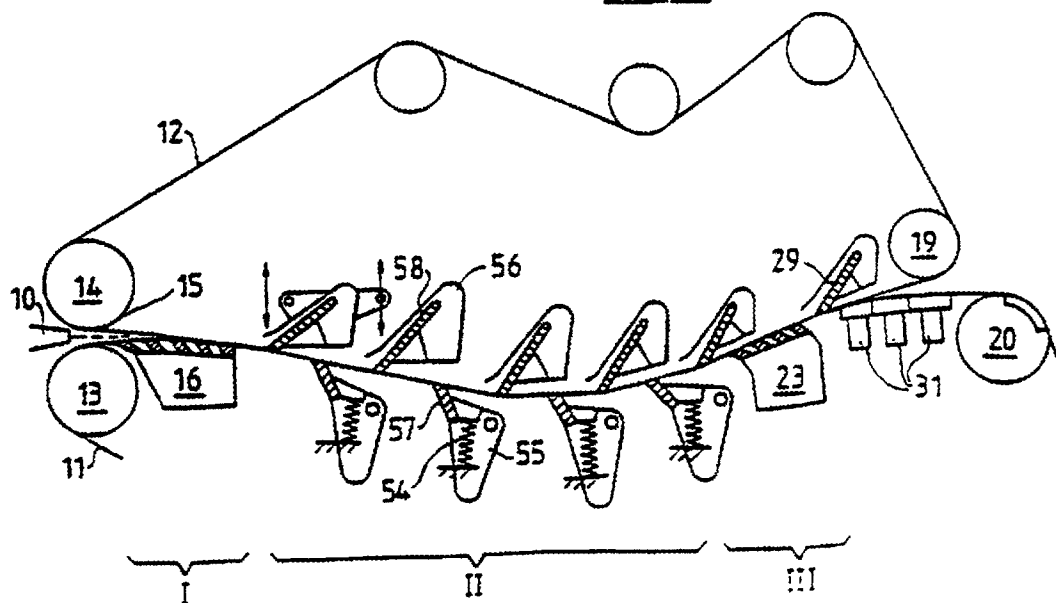


Fig.5



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TWIN WIRE FORMER**RELATED APPLICATIONS**

This is a continuing application of, and hereby incorporates by reference the entire disclosure of, application Ser. No. 08/286,948, filed Aug. 8, 1994 now U.S. Pat. No. 5,500,091, which is a continuing application Ser. No. 08/055,918, filed Apr. 29, 1993, issued Feb. 14, 1995 as U.S. Pat. No. 5,389,206, which is a continuing application Ser. No. 07/773,965, filed as PCT/EP90/01313 Sep. 8, 1990, now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to a twin-wire former for the production of a fiber web, in particular a paper web, from a fiber suspension. The invention proceeds from the basis of the twin-wire former known from British Patent 1 125 906. The features indicated in the patent include a twin wire former for producing a fiber web and particularly a paper web from a fiber suspension. Two web forming wire belts, in the form of endless loops, travel together to form a twin wire zone. The web travels between and along the path of the wire belts through the twin wire zone. The twin wire zone has three sections and the elements in those three sections are described below. The patent describes features that state, in other words, that the forming of the fiber web from the pulp suspension fed from the headbox takes place exclusively between two wire belts. Thus, there is no so-called single-wire pre-drainage path. In a first section of the twin-wire zone, the two wire belts together form a wedge-shaped inlet slot; a jet of pulp slurry coming from the headbox discharges into it. The jet strikes the two wire belts at a place where they pass over a curved drainage element; in the case of the aforementioned British patent, this is a stationary, curved forming shoe. Its curved wire guide surface is formed of a plurality of strips with drainage slots between them. This forming shoe is followed (in a second section of the twin-wire zone) by a drainage strip arranged in the other wire loop and, behind the latter, by a drainage strip arranged in the first-mentioned wire loop (and formed by a first suction box). Finally, in a third section of the twin-wire zone there are a plurality of stationary drainage elements developed as flat suction boxes.

It has been attempted for decades with twin-wire formers of the known type to produce fiber webs (in particular, paper webs) of the highest possible quality with relatively high operating speeds. Due to the forming of the web between two wires, the result, in particular, is obtained that the final fiber web has substantially the same properties on both sides (little "two-sidedness"). However, it is difficult to obtain as uniform as possible a distribution of the fibers in the final fiber web. In other words, it is difficult to obtain a good "formation" since while the web is formed, there is always the danger that fibers will agglomerate and form flocculations. Therefore, it is attempted to form a jet of pulp slurry which pulp slurry is as free as possible of flocculations in the headbox (for instance, by means of a turbulence producer). It is, furthermore, endeavored so to influence the drainage of the fiber suspension during the web-forming that "reflocculation" is avoided as far as possible or that, after possible flocculation, a "deflocculation" (i.e. a breaking up of the flocculations) takes place.

It is known that a curved drainage element arranged in the first section of the twin-wire zone and, in particular, a stationary curved forming shoe developed in accordance with the aforementioned British Patent 1 125 906 counter-

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acts the danger of reflocculation. This is true also of the drainage strips arranged in the British patent in the second section of the twin-wire zone. Nevertheless, the danger of reflocculation is not completely eliminated in the arrangement according to said British patent. Since the number of drainage strips there is very small, a large part of the web-forming takes place in the region of the following flat-suction boxes. They, to be sure, are of high drainage capacity so that the web-forming can be completed in the region of the last flat suction boxes (i.e. the so-called main drainage zone, in which a part of the fiber material is still in the form of a suspension, terminates in the region of the flat suction box). The flat suction boxes, however, are not able to avoid reflocculation or to break up flocculations which have already occurred.

In order to control these last-mentioned difficulties, a web-forming device known under the name of "Duoformer D" has been developed (TAPPI proceedings 1988 annual meeting, pages 75 to 80). This known web-forming device is part of a twin-wire former which has a single-wire pre-drainage zone. In the twin-wire zone there are provided, in the one wire loop, a plurality of strips which are fixed in position but adjustably supported, namely, on the bottom of a suction box which drains in upward direction. Furthermore, a plurality of resiliently supported strips are provided in the other wire loop. By this resilience of the last-mentioned strips, the following result can be obtained: For example, upon an increase of the amount of suspension entering between the two wire belts, the flexibly supported strips can move away somewhat. In this way, the danger (which is present when only firmly supported strips are used) is eliminated of a backing up taking place in the fiber suspension in front of the strips. Such a backing up could destroy the fiber layers which have been formed up to then on the two wire belts. In other words, with this known web-forming device, a drainage pressure, once established, remains constant due to the resiliently supported strips even upon a change in the amount of suspension fed or upon a change in the drainage behavior of the fiber suspension. Therefore, automatic adaptation of the web-forming device to said changed conditions occurs.

With this known web-forming device, fiber webs of relatively good formation can also be formed. With respect to this, however, the demands have increased considerably recently, so that further improvements are desirable.

SUMMARY OF THE INVENTION

The object of the invention is so to develop a twin-wire of the aforementioned kind that the quality of the fiber web produced is further improved, particularly with respect to its formation (cloudiness), and that the twin-wire former can easily be adapted to different operating conditions (for instance, with regard to quantity and drainage behavior of the fiber suspension).

This object is achieved by the features set forth below. In particular, there is a respective drainage strip above each of the two wire belts in the second section of the twin wire zone, and at least one of the two drainage strips is supported resiliently against the respective wire belt while the other may or may not be resiliently supported, and typically is rigidly supported against the respective wire belt. Preferably, there are at least two of the drainage strips and often more against each of the wire belts. The drainage strips against one belt are offset along the path of the wire belts with respect to the drainage strips against the other belt, providing a zig zag or staggered array, and the drainage strips against at least one of the belts are resiliently supported.

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The inventors have found that a combination of known features, namely:

- A. Twin-wire former without a single-wire pre-drainage zone or at least without a single-wire pre-drainage zone of any substantial length such as to cause any appreciable pre-drainage
- B. Start of the drainage in the twin-wire zone at a preferably curved drainage element, for instance on a rotating forming cylinder or, even better, on a curved stationary forming shoe
- C. Further drainage in the twin-wire zone between strips which are arranged along a "zig-zag" line, the strips which rest against the one wire belt being resiliently supported,

leads to an extremely high increase in the quality of the finished fiber web, so that it satisfies even the highest requirements. At the same time, the twin-wire former of the invention is insensitive to changes in the amount of suspension fed and to changes in the drainage behavior of the fiber suspension. Experiments have shown that it is possible by the invention to obtain both a high increase in quality with respect to the formation and also good values with regard to the retention of fillers and fines. In contradistinction to this, in the known double-wire formers it is constantly found that there is a strong reduction in the retention upon an improvement in the formation.

It was, furthermore, found in experiments that in the second section of the twin-wire zone the number of strips can be considerably reduced as compared with the "Duo-former D". However, this number is substantially greater than in the case of the twin-wire former known from British Patent 1 125 906. It is advantageous to increase the distance between adjacent strips as compared with the "Duoformer D". In particular, the drainage strips above each one of the wire belts are of a thickness along the path of the wire belts and the spacing between adjacent strips above each wire belt is a minimum of about three times the strip thickness.

To be sure, from German OS 31 38 133, FIG. 3, a twin-wire former is known the twin-wire zone of which is provided in a first section with a curved stationary drainage element and in a second section with strips arranged along a "zig-zag" line, which strips may also be resiliently supported and there being a relatively large distance between them. However, in that case, in front of the twin-wire zone there is a single-wire pre-drainage zone in which the forming of the web starts initially only in a lower layer of the fiber suspension fed while the upper layer remains liquid and tends very strongly to flocculation. It has been found that these flakes cannot be broken up again to the desired extent in the following twin-wire zone. Another disadvantage is that the twin-wire zone is diverted by a guide roll (14b) behind the second section. This results (due to the so-called table-roll effect) in a further drainage which is uneven over the width of the web and thus in undesired variations in the quality of the web (recognizable, for instance, by disturbing longitudinal stripes).

BRIEF DESCRIPTION OF THE DRAWINGS

Other developments of the invention will be explained below with reference to embodiments which are shown in the drawing. Each of FIGS. 1 to 5 shows in simplified diagrammatic form one of the different embodiments.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The twin-wire former shown in FIG. 1 has a substantially horizontally extending twin-wire zone; this zone comprises

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three sections I, II and III arranged one behind the other. The endless wire belts (lower wire 11 and upper wire 12), shown only in part, travel in the direct vicinity of a headbox 10 over, in each case, a breast roll 13 and 14 respectively, so that the two wire belts together form a wedge-shaped entry slot 15 at the start of the twin-wire zone. The jet pulp discharged by the headbox 10 comes into contact with the two wire belts 11 and 12 only at the place where the lower wire 11 in the first section I of the twin-wire zone travels over a stationary curved forming shoe 16. The curved travel surface thereof is formed of several strips 16' with drainage slits present between them. The distance between the two breast rolls 13 and 14 is variable. The forming shoe 16 can be operated with or without vacuum. Additionally, although it is preferable that the forming shoe 16 be curved, a straight forming shoe may also be used in certain situations.

In the second section II of the twin-wire zone, the two wire belts 11 and 12 (with the partially still liquid fiber suspension present between them) travel between a lower drainage box 17 and an upper drainage box 18. In the lower drainage box 17 there are a row of at least two strips 27 (preferably of approximately rectangular cross section) which are pressed from below resiliently against the lower wire 11. For this purpose, they are supported, for instance, on springs 24 (or pneumatic pressure cushions) on a, preferably water-permeable, plate. It is obvious that the force of the springs (or of the pressure prevailing in the pressure cushions) is individually adjustable.

The upper drainage box 18 is suspended on both the front and rear ends on vertically displaceable support elements as indicated diagrammatically by double arrows. On its lower side, there is a row of at least three strips 28 of preferably parallelogram cross section which rest against the upper side of the upper wire 12 and are rigidly attached to the box 18. Above the strips 28, a front vacuum chamber 21 and a rear vacuum chamber 22 are present in the drainage box 18.

Each of the upper strips 28 scrapes off water from the wire 12. Accordingly, the amount of water scraped off decreases in the direction of flow of the wire 12 from strip to strip. The drainage water from each of the strips 28 except the drainage water scraped off by the first strip may be drained away jointly. However, it is disadvantageous to also include the drainage water from the first strip 28 since this generally would disturb the operation of the other strips. Accordingly, a vertical channel 21a is positioned in front of the first upper strip 28 to carry away or collect the water scraped off by the first strip 28.

In the region of the forming shoe 16, a part of the water of the fiber suspension is led off downward; another part penetrates due to the tension of the upper wire 12 upwards through the upper wire and is deflected by the furthest in front of the strips 28 into the front vacuum chamber 21. The water passing upward between the upper strips 28 enters into the rear vacuum chamber 22. The water penetrating between the lower strips 27 through the lower wire 11 is led off downward. Between adjacent upper drainage strips 28 there is a minimum distance X of about three times the thickness Y of the strips. The same is true of the lower resiliently supported strips 27. It is important that each of the strips 27 and 28 lies in the region of a space between two opposite strips so that a "zig-zag" arrangement (i.e. non-opposing relationship) is present. Also, as seen in FIG. 1, the first one of the strips 28 is located upstream of the first one of the strips 27. The two wires 11 and 12 preferably travel on a straight path through section II. Gentle curvature of this section of the path is, however, also possible; see FIGS. 2 and 5. Differing from FIG. 1, the resiliently supported strips

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could also be arranged in the upper box 18 and the firmly supported strips in the lower box 17. In the third section III of the twin-wire zone, both wire belts 11 and 12 travel over another preferably curved forming shoe 23 which (as shown) is arranged preferably in the lower wire loop 11. Behind it, an additional strip 29 with vacuum chamber 30 can be arranged in the loop of the upper wire 12. Furthermore, flat suction boxes 31 can be present in the loop of the lower wire. There (as is shown by dash-dot lines) the upper wire 12 can be separated by means of a guide roll 19 from the lower wire 11 and from the fiber web formed. Lower wire and fiber web then travel over a wire suction roll 20. The guide roll 19 can, however, also lie further back, so that the upper wire 12 is separated from the lower wire 11 only on the wire suction roll 20.

It is important that two drainage boxes 17 and 18 with the alternately resiliently and firmly supported ledge strips 27 and 28 lie not in the front or the rear sections but in the middle section II of the twin-wire zone, since only here can they develop their full effect, namely, intensive drainage of the fiber suspension fed while retaining the fine flocculation-free fiber distribution. This is achieved in the manner that the corresponding wire belt is imparted a slight (scarcely visible) deflection on each strip so that turbulence is constantly produced in the still liquid part of the fiber pulp. For success it is, however, also decisive that previously, in section I, a known pre-drainage towards both sides has already taken place and that this also takes place with the greatest possible retention of the flocculation-free condition of the fiber suspension.

For this two-sided pre-drainage, a stationary preferably curved forming shoe is provided in the first section I of the twin-wire zone (in accordance with FIGS. 1 and 3-5) whenever it is a question of satisfying the highest quality demands with respect to the formation. This effect of the forming shoe is due to the fact that at least the one wire belt travels polygonally from strip to strip, each strip not only leading water away but also producing turbulence in the pulp which is still liquid. With such a forming shoe, it is, however, difficult at times to obtain a stable operating condition upon the starting of the paper machine. Therefore, it may be advantageous to provide a known forming roll 40 in accordance with FIG. 2 in Section I instead of the stationary forming shoe and the breast roll lying in front of it. This possibility will be utilized when, in particular, the highest productivity is demanded from the paper manufacturing machine.

In the third section III, the aforementioned strip 29 can serve either solely to lead away water upwards or, in addition, for the further production of turbulence (for further improvement in quality). The latter is possible if a part of the fiber pulp is still in liquid condition at this place.

In FIGS. 1 to 3, the distance between the two wires 11 and 12 in the twin-wire zone has been shown greatly exaggerated. By this, it is intended to make it clear that the two wires 11 and 12 converge towards each other over a relatively long path within the twin-wire zone. This makes it clear that the process of web-forming on the first forming shoe 16 (in Section I) commences relatively slowly and is completed only in Section III. In this connection, the end of the main drainage zone in which the two wires converge towards each other (and thus, the end of the web-forming process) can lie approximately in the center of the wrapping zone of the second forming shoe 23, as is indicated, merely by way of example, in FIGS. 1 to 3. The end of the wire convergence is symbolically indicated there by the point E; the solids content of the paper web has reached there approximately

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the value of 8%. This point can, however, also lie, for instance, on one of the flat suction boxes 31. Behind this point, it is attempted further to increase the solids content, if possible even before the separation of the two wires. One goal is, namely, for the separation of the wires to take place with the highest possible solids content of the web so that as few fibers as possible are torn out of the web upon the separation. The nature and number of the drainage elements necessary for this within the twin-wire zone may, however, differ greatly and is dependent, among other things, on the type of paper and the raw-material components thereof, as well as on the operating speed.

The embodiments shown in FIGS. 2 and 3 differ from the others primarily by the fact that the twin-wire zone rises substantially vertically upward in the direction of travel of the wires. In this way, the removal of the water withdrawn from the fiber suspension is simplified since the water can be discharged relatively uniformly towards both sides. No vacuum chambers are required in particular in the central section II of the twin-wire zone. To be sure, the forming roll 40 of FIG. 2 is, as a rule, developed as a suction roll. The forming shoes 16, 23, particularly those arranged in the third section III, can, if necessary, be provided with a suction device.

Further elements of the twin-wire former shown in FIG. 2 are water-collection containers 41, 42 and 43, guide plates 44 associated with the fixed strips 28, and a water removal strip 45. The other elements are provided with the same reference numbers as the corresponding elements in FIG. 1. The same is true with regard to FIG. 3. One possible modification of FIG. 3 can consist therein that, instead of the wire suction roll 20, a forming roll is provided, and instead of the guide roll 19 the wire suction roll. A similar arrangement is known from German Utility Model 88 06 036 (Voith File: P 4539). Aside from this exception and aside from the embodiment according to FIG. 2 (with forming roll 40), the invention will, however, be used whenever possible-so to design the twin-wire former that the relatively expensive forming roll (as to purchase and operation) can be dispensed with. Thus, as a rule, the wire suction roll 20 is present as the sole suction roll. Furthermore, in all embodiments of the invention it can be seen to it that no guide roll which deflects the twin-wire zone (and has the above-mentioned injurious table-roll effect) is present.

The embodiment of FIG. 4 differs from FIG. 1 among other things by the fact that, in the first section I of the twin-wire zone, a second curved stationary forming shoe 16a is arranged in the loop of the lower wire 11 behind and spaced from a first curved stationary forming shoe 16. Furthermore, in the loop of the upper wire 12 in the region between the two stationary forming shoes 16 and 16a there is provided an individual strip 50 which in known manner is part of a vacuum chamber 51. This vacuum chamber 51, similar to the upper drainage box 18 of FIG. 1, is suspended on its front and rear ends in vertically displaceable mounts. In this way, both the depth of penetration of the strip 50 into the path of travel of the upper wire 12 as well as the angle of attack of the strip 50 can be varied. With slight depth of penetration, the strip 50 serves solely for removal of water, while with greater depth of penetration it serves, in addition, for the production of turbulence in the suspension and, thus, for improvement of the formation. By the presence of two separate forming shoes 16 and 16a, the pre-drainage on both sides is temporarily interrupted; it is only continued after the strip 50 has removed from the upper wire 12 the water which has penetrated upward on the first forming shoe 16. In this way, higher operating speeds are possible.

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Another difference from FIG. 1 is that, in the second section II of the twin-wire zone, the lower, flexibly supported strips 57 and the upper, firmly supported strips 58 are developed as individual strips. This means that each strip has its own supporting body 55/56. The lower strip-supporting bodies 55 are swingably mounted, the strip 57 being pressed resiliently by the force of springs 54 against the bottom of the lower wire 11. The supporting body 56 of each of the upper strips 58 is developed as vacuum chamber in the same way as that of the strip 50. The suspension of these vacuum chambers 56 corresponds to that of the vacuum chamber 51. It is important that each of the strips 57 and 58 rest with a given force of application (corresponding to the suspension pressure) against its wire belt 11 or 12. The strips 57 and 58 are adjusted in such a manner that a slight deflection of the wire belts takes place preferably on each strip. Due to the resilient supporting of the lower strips 57, the adjustment, once effected, is insensitive to changes in the quantity or quality of pulp, so that no backing up takes place in front of the strips and, nevertheless, an effective introduction of turbulence forces into the fiber suspension takes place. In contradistinction to FIGS. 1 to 3, there is the possibility of adjusting each one of the strips 57/58 individually with respect to position in height and inclination relative to the travel path of the wire. In this way, one can even better control the quality of the paper produced, with respect to both the formation and the nature of its surface (printability). Differing from FIG. 4, the upper strips 58 could be supported resiliently and the lower strips 57 stationary. Another alternative could consist therein that not only the upper strips 58 but also the lower strips 57 are fastened in vertically displaceable mounts (as shown on the vacuum chamber 51). In such case, the springs 54 might possibly be eliminated.

Another difference between FIGS. 1 and 4 resides in the fact that in FIG. 4 the twin-wire zone rises in the direction of travel of the wires upwards with an inclination of, on the average, about 20° with respect to the horizontal. In this way, it is possible to keep the entire height of the twin-wire former relatively slight. In the third section III of the twin-wire zone, a flat forming shoe 23' is provided rather than a curved one, differing from FIG. 1. The separation of the upper wire 12 from the lower wire and the fiber web formed can take place, as in FIG. 1, on one of the flat suction boxes 31. Instead of this, however, the upper wire 12 can also be conducted up to the wire suction roll 20. There, as shown, it can wrap around a small part (or, alternatively, a larger part) of the circumference of the wire suction roll and then be returned via the reversing roll 19.

In the embodiment shown in FIG. 5, the twin-wire zone, as a whole, extends substantially in horizontal direction. The individual elements are substantially the same as in the embodiment of FIG. 4. However, there is the difference that the drainage strips 57 and 58 lying in the second section II of the twin-wire zone are arranged along a downwardly curved path of the twin-wire zone. Accordingly, an upwardly curved forming shoe 16, 23 is provided in the first section I and in the third section III of the twin-wire zone. This embodiment is advisable, in particular, for the modernizing of existing Fourdrinier paper machines.

The embodiments shown have the feature in common that, in the second section II of the twin-wire zone, there are present preferably n flexibly supported strips 27/57 and $n+1$ rigidly supported strips. However, it is also possible to make the number of flexibly supported strips equal to or greater by one than the number of rigidly supported strips. Instead of a rigidly supported strip, a feed or discharge edge of a drainage box can also be provided. The minimum number n

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of flexibly supported strips is two (see FIG. 4). However, three or four flexibly supported strips are preferred.

What is claimed is:

1. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt;

first means for collecting the water drained from the fiber suspension by the most upstream, one of the drainage strips;

second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the twin wire zone being free of rolls which deflect the twin wire zone.

2. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber sus-

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pension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone; the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact; second support means supporting the second drainage strips rigidly against the second wire belt; first means for collecting the water drained from the fiber suspension by the most upstream one of the drainage strips; second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone: a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the twin wire zone being free of any forming rolls.

3. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising: first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone; each wire belt forming an endless loop; the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone; the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips; second support means supporting the second drainage strips rigidly against the second wire belt;

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the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith; and the twin wire zone being free of rolls which deflect the twin wire zone.

4. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising: first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone; each wire belt forming an endless loop; the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone; the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips; second support means supporting the second drainage strips rigidly against the second wire belt; the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element; and the twin wire zone being free of any forming rolls.

5. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising: first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone; each wire belt forming an endless loop; the twin wire zone having a first section which includes a single first drainage element at the start of the path

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through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone; said single first drainage element in the first section being a single forming roll having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the belts through the twin wire zone, the single forming roll being engaged by one of the wire belts for curving the path of the belts around the single forming roll after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts

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with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt; and

means for supplying a vacuum in the area of the second drainage strips;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section, for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone apart from said single forming roll being free of rolls which deflect the twin wire zone.

* * * * *

Exhibit 2



US005972168A

United States Patent [19]**Egelhof et al.**[11] **Patent Number:** **5,972,168**[45] **Date of Patent:** **Oct. 26, 1999**[54] **TWIN WIRE FORMER**

[75] Inventors: **Dieter Egelhof**; **Klaus Henseler**, both of Heidenheim, Germany; **Werner Kade**, Neenah, Wis.; **Albrecht Meinecke**, Heidenheim, Germany; **Wilhelm Wanke**, Heidenheim, Germany; **Hans-Jurgen Wulz**, Heidenheim, Germany; **Rudolf Bück**, deceased, late of Heidenheim, Germany, by **Elsie Bück**, legal representative

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[73] Assignee: **Voith Sulzer Papiertechnik Patent GmbH**, Germany

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[21] Appl. No.: **09/161,138**[22] Filed: **Sep. 25, 1998****Related U.S. Application Data**

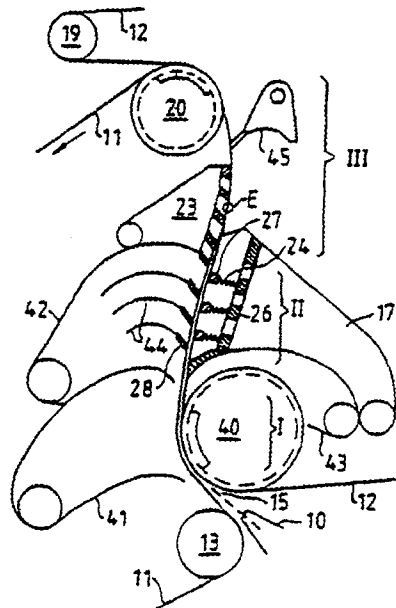
[62] Continuation of application No. 09/023,435, Feb. 13, 1998, which is a continuation of application No. 08/556,769, Nov. 2, 1995, Pat. No. 5,718,805, which is a continuation of application No. 08/286,948, Aug. 8, 1994, Pat. No. 5,500,091, which is a continuation of application No. 08/055,918, Apr. 29, 1993, Pat. No. 5,389,206, which is a continuation of application No. 07/773,965, abandoned, filed as application No. PCT/EP90/01313, Sep. 8, 1990.

[51] Int. Cl.⁶ **D21F 1/00**[52] U.S. Cl. **162/203; 162/301**[58] Field of Search **162/203, 300, 162/301, 303, 348, 352**[56] **References Cited****U.S. PATENT DOCUMENTS**

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Primary Examiner—Karen M. Hastings*Attorney, Agent, or Firm*—Ostrolenk, Faber, Gerb & Soffen, LLP[57] **ABSTRACT**

In a twin-wire former for the production of a paper web, two wire belts (11 and 12) together form a twin-wire zone which is divided into three sections (I, II and III). In the first section (I) the two wires (11, 12) travel over a curved forming shoe (16). They form there a wedge-shaped inlet slot (15) with which a headbox (10) is directly associated. In the second section (II), several resiliently supported strips (27) rest against the lower wire (11) and between each of said strips (27) a rigidly mounted strip (28) rests against the upper wire (12). In the third section (III) both wire belts (11, 12) pass over another curved forming shoe (23).

8 Claims, 2 Drawing Sheets

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Sheet 1 of 2

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Fig.1

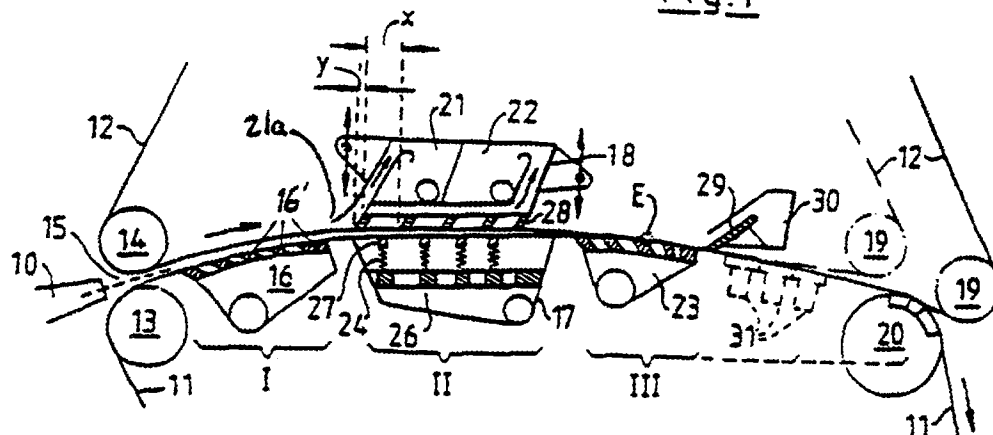


Fig.2

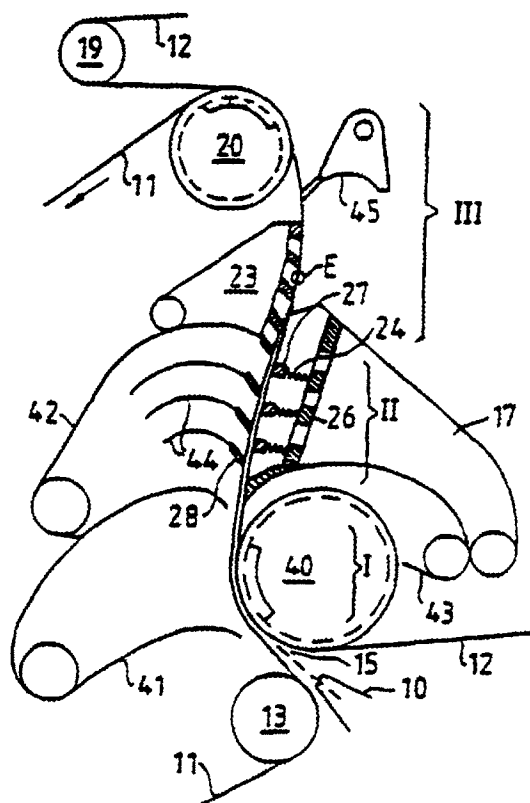


Fig.3

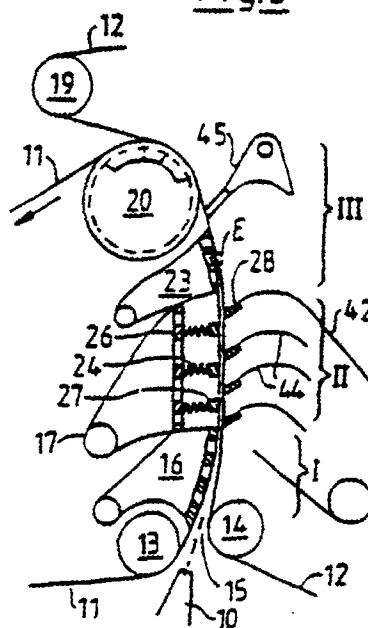


Fig.4

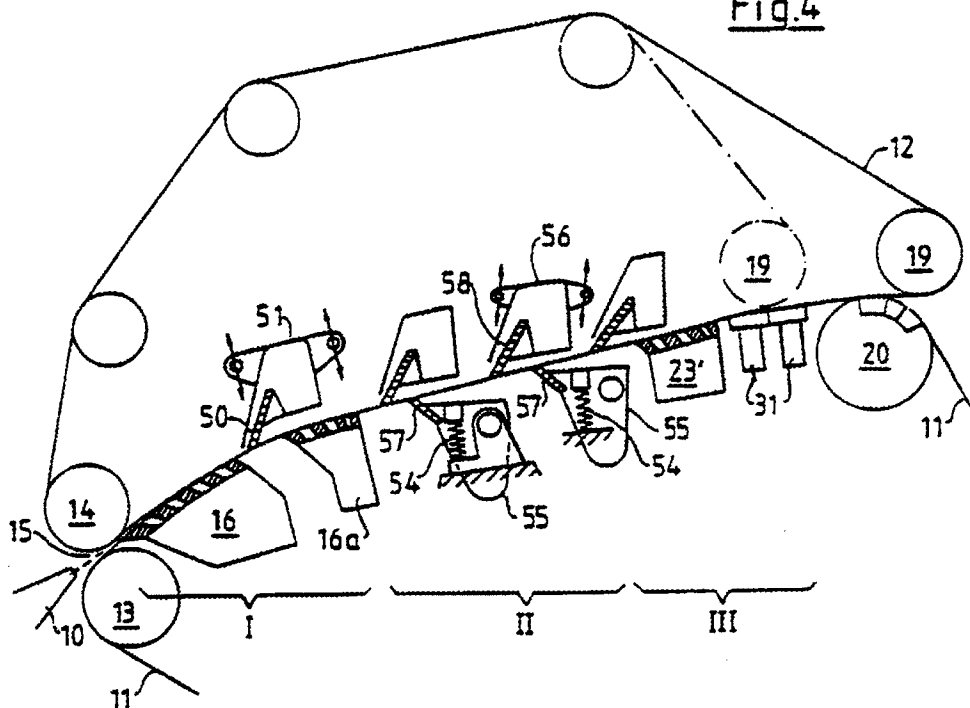
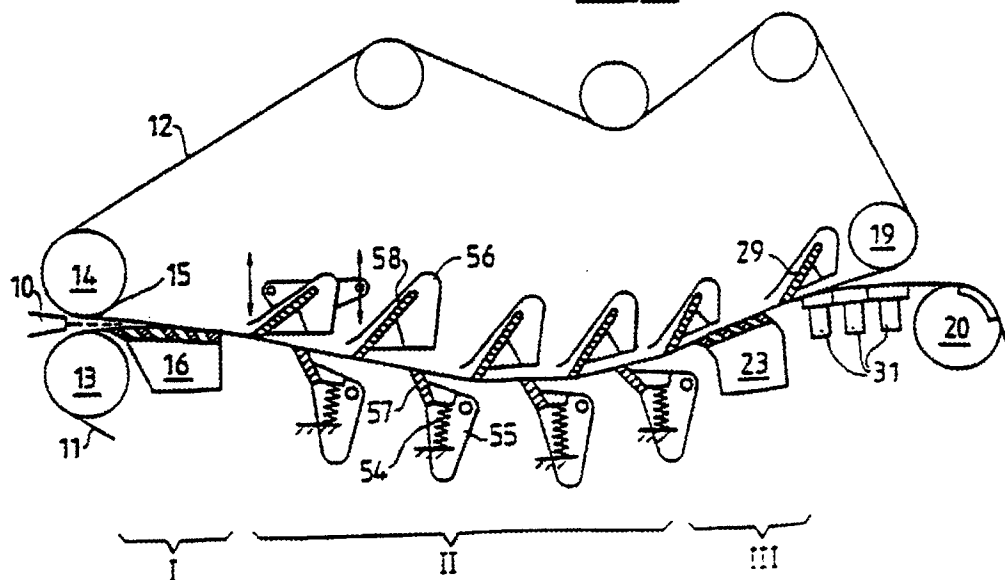


Fig.5



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TWIN WIRE FORMER**RELATED APPLICATIONS**

This is a continuing application of, and hereby incorporates by reference the entire disclosure of, application Ser. No. 09/023,435, filed Feb. 13, 1998, allowed, which is a continuing application of Ser. No. 08/556,769, filed Nov. 2, 1995, now Pat. No. 5,718,805, which is a continuing application of Ser. No. 08/286,948, filed Aug. 8, 1994, now Pat. No. 5,500,091, which is a continuing application of Ser. No. 08/055,918, filed Apr. 29, 1993, now Pat. No. 5,389,206, which is a continuing application of Ser. No. 07/773,965, filed Nov. 12, 1991, now abandoned, filed as PCT/EP90/01313 on Sept. 8, 1990, now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to a twin-wire former for the production of a fiber web, in particular a paper web, from a fiber suspension. The invention proceeds from the basis of the twin-wire former known from British Patent 1 125 906. The features indicated in the patent include a twin wire former for producing a fiber web and particularly a paper web from a fiber suspension. Two web forming wire belts, in the form of endless loops, travel together to form a twin wire zone. The web travels between and along the path of the wire belts through the twin wire zone. The twin wire zone has three sections and the elements in those three sections are described below. The patent describes features that state, in other words, that the forming of the fiber web from the pulp suspension fed from the headbox takes place exclusively between two wire belts. Thus, there is no so-called single-wire pre-drainage path. In a first section of the twin-wire zone, the two wire belts together form a wedge-shaped inlet slot; a jet of pulp slurry coming from the headbox discharges into it. The jet strikes the two wire belts at a place where they pass over a curved drainage element; in the case of the aforementioned British patent, this is a stationary, curved forming shoe. Its curved wire guide surface is formed of a plurality of strips with drainage slots between them. This forming shoe is followed (in a second section of the twin-wire zone) by a drainage strip arranged in the other wire loop and, behind the latter, by a drainage strip arranged in the first-mentioned wire loop (and formed by a first suction box). Finally, in a third section of the twin-wire zone there are a plurality of stationary drainage elements developed as flat suction boxes.

It has been attempted for decades with twin-wire formers of the known type to produce fiber webs (in particular, paper webs) of the highest possible quality with relatively high operating speeds. Due to the forming of the web between two wires, the result, in particular, is obtained that the final fiber web has substantially the same properties on both sides (little "two-sidedness"). However, it is difficult to obtain as uniform as possible a distribution of the fibers in the final fiber web. In other words, it is difficult to obtain a good "formation" since while the web is formed, there is always the danger that fibers will agglomerate and form flocculations. Therefore, it is attempted to form a jet of pulp slurry which pulp slurry is as free as possible of flocculations in the headbox (for instance, by means of a turbulence producer). It is, furthermore, endeavored so to influence the drainage of the fiber suspension during the web-forming that "reflocculation" is avoided as far as possible or that, after possible flocculation, a "deflocculation" (i.e. a breaking up of the flocculations) takes place.

It is known that a curved drainage element arranged in the first section of the twin-wire zone and, in particular, a

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stationary curved forming shoe developed in accordance with the aforementioned British Patent 1 125 906 counteracts the danger of reflocculation. This is true also of the drainage strips arranged in the British Patent in the second section of the twin-wire zone. Nevertheless, the danger of reflocculation is not completely eliminated in the arrangement according to said British Patent. Since the number of drainage strips there is very small, a large part of the web-forming takes place in the region of the following flat-suction boxes. They, to be sure, are of high drainage capacity so that the web-forming can be completed in the region of the last flat suction boxes (i.e. the so-called main drainage zone, in which a part of the fiber material is still in the form of a suspension, terminates in the region of the flat suction box). The flat suction boxes, however, are not able to avoid reflocculation or to break up flocculations which have already occurred.

In order to control these last-mentioned difficulties, a web-forming device known under the name of "Duoformer D" has been developed (TAPPI Proceedings 1988 annual meeting, pages 75 to 80). This known web-forming device is part of a twin-wire former which has a single-wire pre-drainage zone. In the twin-wire zone there are provided, in the one wire loop, a plurality of strips which are fixed in position but adjustably supported, namely, on the bottom of a suction box which drains in upward direction. Furthermore, a plurality of resiliently supported strips are provided in the other wire loop. By this resilience of the last-mentioned strips, the following result can be obtained: For example, upon an increase of the amount of suspension entering between the two wire belts, the flexibly supported strips can move away somewhat. In this way, the danger (which is present when only firmly supported strips are used) is eliminated of a backing up taking place in the fiber suspension in front of the strips. Such a backing up could destroy the fiber layers which have been formed up to then on the two wire belts. In other words, with this known web-forming device, a drainage pressure, once established, remains constant due to the resiliently supported strips even upon a change in the amount of suspension fed or upon a change in the drainage behavior of the fiber suspension. Therefore, automatic adaptation of the web-forming device to said changed conditions occurs.

With this known web-forming device, fiber webs of relatively good formation can also be formed. With respect to this, however, the demands have increased considerably recently, so that further improvements are desirable.

SUMMARY OF THE INVENTION

The object of the invention is so to develop a twin-wire of the aforementioned kind that the quality of the fiber web produced is further improved, particularly with respect to its formation (cloudiness), and that the twin-wire former can easily be adapted to different operating conditions (for instance, with regard to quantity and drainage behavior of the fiber suspension).

This object is achieved by the features set forth below in particular, there is a respective drainage strip above each of the two wire belts in the second section of the twin wire zone, and at least one of the two drainage strips is supported resiliently against the respective wire belt while the other may or may not be resiliently supported, and typically is rigidly supported against the respective wire belt. Preferably, there are at least two of the drainage strips and often more against each of the wire belts. The drainage strips against one belt are offset along the path of the wire belts with

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respect to the drainage strips against the other belt, providing a zig zag or staggered array, and the drainage strips against at least one of the belts are resiliently supported.

The inventors have found that a combination of known features, namely:

- A. Twin-wire former without a single-wire pre-drainage zone or at least without a single-wire pre-drainage zone of any substantial length such as to cause any appreciable pre-drainage
- B. Start of the drainage in the twin-wire zone at a preferably curved drainage element, for instance on a rotating forming cylinder or, even better, on a curved stationary forming shoe
- C. Further drainage in the twin-wire zone between strips which are arranged along a "zig-zag" line, the strips which rest against the one wire belt being resiliently supported, leads to an extremely high increase in the quality of the finished fiber web, so that it satisfies even the highest requirements. At the same time, the twin-wire former of the invention is insensitive to changes in the amount of suspension fed and to changes in the drainage behavior of the fiber suspension. Experiments have shown that it is possible by the invention to obtain both a high increase in quality with respect to the formation and also good values with regard to the retention of fillers and fines. In contradistinction to this, in the known double-wire formers it is constantly found that there is a strong reduction in the retention upon an improvement in the formation.

It was, furthermore, found in experiments that in the second section of the twin-wire zone the number of strips can be considerably reduced as compared with the "Duo-former D". However, this number is substantially greater than in the case of the twin-wire former known from British Patent 1 125 906. It is advantageous to increase the distance between adjacent strips as compared with the "Duo-former D". In particular, the drainage strips above each one of the wire belts are of a thickness along the path of the wire belts and the spacing between adjacent strips above each wire belt is a minimum of about three times the strip thickness.

To be sure, from German OS 31 38 133, FIG. 3, a twin-wire former is known the twin-wire zone of which is provided in a first section with a curved stationary drainage element and in a second section with strips arranged along a "zig-zag" line, which strips may also be resiliently supported and there being a relatively large distance between them. However, in that case, in front of the twin-wire zone there is a single-wire pre-drainage zone in which the forming of the web starts initially only in a lower layer of the fiber suspension fed while the upper layer remains liquid and tends very strongly to flocculation. It has been found that these flakes cannot be broken up again to the desired extent in the following twin-wire zone. Another disadvantage is that the twin-wire zone is diverted by a guide roll (14b) behind the second section. This results (due to the so-called table-roll effect) in a further drainage which is uneven over the width of the web and thus in undesired variations in the quality of the web (recognizable, for instance, by disturbing longitudinal stripes).

BRIEF DESCRIPTION OF THE DRAWINGS

Other developments of the invention will be explained below with reference to embodiments which are shown in the drawing. Each of FIGS. 1 to 5 shows in simplified diagrammatic form one of the different embodiments.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The twin-wire former shown in FIG. 1 has a substantially horizontally extending twin-wire zone; this zone comprises

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three sections I, II and III arranged one behind the other. The endless wire belts (lower wire 11 and upper wire 12), shown only in part, travel in the direct vicinity of a headbox 10 over, in each case, a breast roll 13 and 14 respectively, so that the two wire belts together form a wedge-shaped entry slot 15 at the start of the twin-wire zone. The jet pulp discharged by the headbox 10 comes into contact with the two wire belts 11 and 12 only at the place where the lower wire 11 in the first section I of the twin-wire zone travels over a stationary curved forming shoe 16. The curved travel surface thereof is formed of several strips 16' with drainage slits present between them. The distance between the two breast rolls 13 and 14 is variable. The forming shoe 16 can be operated with or without vacuum. Additionally, although it is preferable that the forming shoe 16 be curved, a straight forming shoe may also be used in certain situations.

In the second section II of the twin-wire zone, the two wire belts 11 and 12 (with the partially still liquid fiber suspension present between them) travel between a lower drainage box 17 and an upper drainage box 18. In the lower drainage box 17 there are a row of at least two strips 27 (preferably of approximately rectangular cross section) which are pressed from below resiliently against the lower wire 11. For this purpose, they are supported, for instance, on springs 24 (or pneumatic pressure cushions) on a, preferably water-permeable, plate. It is obvious that the force of the springs (or of the pressure prevailing in the pressure cushions) is individually adjustable.

The upper drainage box 18 is suspended on both the front and rear ends on vertically displaceable support elements as indicated diagrammatically by double arrows. On its lower side, there is a row of at least three strips 28 of preferably parallelogram cross section which rest against the upper side of the upper wire 12 and are rigidly attached to the box 18. Above the strips 28, a front vacuum chamber 21 and a rear vacuum chamber 22 are present in the drainage box 18.

Each of the upper strips 28 scrapes off water from the wire 12. Accordingly, the amount of water scraped off decreases in the direction of flow of the wire 12 from strip to strip. The drainage water from each of the strips 28 except the drainage water scraped off by the first strip may be drained away jointly. However, it is disadvantageous to also include the drainage water from the first strip 28 since this generally would disturb the operation of the other strips. Accordingly, a vertical channel 21a is positioned in front of the first upper strip 28 to carry away or collect the water scraped off by the first strip 28.

In the region of the forming shoe 16, a part of the water of the fiber suspension is led off downward; another part penetrates due to the tension of the upper wire 12 upwards through the upper wire and is deflected by the furthest in front of the strips 28 into the front vacuum chamber 21. The water passing upward between the upper strips 28 enters into the rear vacuum chamber 22. The water penetrating between the lower strips 27 through the lower wire 11 is led off downward. Between adjacent upper drainage strips 28 there is a minimum distance X of about three times the thickness Y of the strips. The same is true of the lower resiliently supported strips 27. It is important that each of the strips 27 and 28 lies in the region of a space between two opposite strips so that a "zig-zag" arrangement (i.e. non-opposing relationship) is present. Also, as seen in FIG. 1, the first one of the strips 28 is located upstream of the first one of the strips 27. The two wires 11 and 12 preferably travel on a straight path through section II. Gentle curvature of this section of the path is, however, also possible; see FIGS. 2 and 5. Differing from FIG. 1, the resiliently supported strips

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could also be arranged in the upper box 18 and the firmly supported strips in the lower box 17. In the third section III of the twin-wire zone, both wire belts 11 and 12 travel over another preferably curved forming shoe 23 which (as shown) is arranged preferably in the lower wire loop 11. Behind it, an additional strip 29 with vacuum chamber 30 can be arranged in the loop of the upper wire 12. Furthermore, flat suction boxes 31 can be present in the loop of the lower wire. There (as is shown by dash-dot lines) the upper wire 12 can be separated by means of a guide roll 19 from the lower wire 11 and from the fiber web formed. Lower wire and fiber web then travel over a wire suction roll 20. The guide roll 19 can, however, also lie further back, so that the upper wire 12 is separated from the lower wire 11 only on the wire suction roll 20.

It is important that two drainage boxes 17 and 18 with the alternately resiliently and firmly supported ledge strips 27 and 28 lie not in the front or the rear sections but in the middle section II of the twin-wire zone, since only here can they develop their full effect, namely, intensive drainage of the fiber suspension fed while retaining the fine flocculation-free fiber distribution. This is achieved in the manner that the corresponding wire belt is imparted a slight (scarcely visible) deflection on each strip so that turbulence is constantly produced in the still liquid part of the fiber pulp. For success it is, however, also decisive that previously, in section I, a known pre-drainage towards both sides has already taken place and that this also takes place with the greatest possible retention of the flocculation-free condition of the fiber suspension.

For this two-sided pre-drainage, a stationary preferably curved forming shoe is provided in the first section I of the twin-wire zone (in accordance with FIGS. 1 and 3-5) whenever it is a question of satisfying the highest quality demands with respect to the formation. This effect of the forming shoe is due to the fact that at least the one wire belt travels polygonally from strip to strip, each strip not only leading water away but also producing turbulence in the pulp which is still liquid. With such a forming shoe, it is, however, difficult at times to obtain a stable operating condition upon the starting of the paper machine. Therefore, it may be advantageous to provide a known forming roll 40 in accordance with FIG. 2 in Section I instead of the stationary forming shoe and the breast roll lying in front of it. This possibility will be utilized when, in particular, the highest productivity is demanded from the paper manufacturing machine.

In the third section III, the aforementioned strip 29 can serve either solely to lead away water upwards or, in addition, for the further production of turbulence (for further improvement in quality). The latter is possible if a part of the fiber pulp is still in liquid condition at this place.

In FIGS. 1 to 3, the distance between the two wires 11 and 12 in the twin-wire zone has been shown greatly exaggerated. By this, it is intended to make it clear that the two wires 11 and 12 converge towards each other over a relatively long path within the twin-wire zone. This makes it clear that the process of web-forming on the first forming shoe 16 (in Section I) commences relatively slowly and is completed only in Section III. In this connection, the end of the main drainage zone in which the two wires converge towards each other (and thus, the end of the web-forming process) can lie approximately in the center of the wrapping zone of the second forming shoe 23, as is indicated, merely by way of example, in FIGS. 1 to 3. The end of the wire convergence is symbolically indicated there by the point E; the solids content of the paper web has reached there approximately

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the value of 8%. This point can, however, also lie, for instance, on one of the flat suction boxes 31. Behind this point, it is attempted further to increase the solids content, if possible even before the separation of the two wires. One goal is, namely, for the separation of the wires to take place with the highest possible solids content of the web so that as few fibers as possible are torn out of the web upon the separation. The nature and number of the drainage elements necessary for this within the twin-wire zone may, however, differ greatly and is dependent, among other things, on the type of paper and the raw-material components thereof, as well as on the operating speed.

The embodiments shown in FIGS. 2 and 3 differ from the others primarily by the fact that the twin-wire zone rises substantially vertically upward in the direction of travel of the wires. In this way, the removal of the water withdrawn from the fiber suspension is simplified since the water can be discharged relatively uniformly towards both sides. No vacuum chambers are required in particular in the central section II of the twin-wire zone. To be sure, the forming roll 40 of FIG. 2 is, as a rule, developed as a suction roll. The forming shoes 16, 23, particularly those arranged in the third section III, can, if necessary, be provided with a suction device.

Further elements of the twin-wire former shown in FIG. 2 are water-collection containers 41, 42 and 43, guide plates 44 associated with the fixed strips 28, and a water removal strip 45. The other elements are provided with the same reference numbers as the corresponding elements in FIG. 1. The same is true with regard to FIG. 3. One possible modification of FIG. 3 can consist therein that, instead of the wire suction roll 20, a forming roll is provided, and instead of the guide roll 19 the wire suction roll. A similar arrangement is known from German Utility Model 88 06 036 (Voith File: P 4539). Aside from this exception and aside from the embodiment according to FIG. 2 (with forming roll 40), the invention will, however, be used whenever possible-so to design the twin-wire former that the relatively expensive forming roll (as to purchase and operation) can be dispensed with. Thus, as a rule, the wire suction roll 20 is present as the sole suction roll. Furthermore, in all embodiments of the invention it can be seen to it that no guide roll which deflects the twin-wire zone (and has the above-mentioned injurious table-roll effect) is present.

The embodiment of FIG. 4 differs from FIG. 1 among other things by the fact that, in the first section I of the twin-wire zone, a second curved stationary forming shoe 16a is arranged in the loop of the lower wire 11 behind and spaced from a first curved stationary forming shoe 16. Furthermore, in the loop of the upper wire 12 in the region between the two stationary forming shoes 16 and 16a there is provided an individual strip 50 which in known manner is part of a vacuum chamber 51. This vacuum chamber 51, similar to the upper drainage box 18 of FIG. 1, is suspended on its front and rear ends in vertically displaceable mounts. In this way, both the depth of penetration of the strip 50 into the path of travel of the upper wire 12 as well as the angle of attack of the strip 50 can be varied. With slight depth of penetration, the strip 50 serves solely for removal of water, while with greater depth of penetration it serves, in addition, for the production of turbulence in the suspension and, thus, for improvement of the formation. By the presence of two separate forming shoes 16 and 16a, the pre-drainage on both sides is temporarily interrupted; it is only continued after the strip 50 has removed from the upper wire 12 the water which has penetrated upward on the first forming shoe 16. In this way, higher operating speeds are possible.

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Another difference from FIG. 1 is that, in the second section II of the twin-wire zone, the lower, flexibly supported strips 57 and the upper, firmly supported strips 58 are developed as individual strips. This means that each strip has its own supporting body 55/56. The lower strip-supporting bodies 55 are swingably mounted, the strip 57 being pressed resiliently by the force of springs 54 against support bottom of the lower wire 11. The supporting body 56 of each of the upper strips 58 is developed as vacuum chamber in the same way as that of the strip 50. The suspension of these vacuum chambers 56 corresponds to that of the vacuum chamber 51. It is important that each of the strips 57 and 58 rest with a given force of application (corresponding to the suspension pressure) against its wire belt 11 or 12. The strips 57 and 58 are adjusted in such a manner that a slight deflection of the wire belts takes place preferably on each strip. Due to the resilient supporting of the lower strips 57, the adjustment, once effected, is insensitive to changes in the quantity or quality of pulp, so that no backing up takes place in front of the strips and, nevertheless, an effective introduction of turbulence forces into the fiber suspension takes place. In contradistinction to FIGS. 1 to 3, there is the possibility of adjusting each one of the strips 57/58 individually with respect to position in height and inclination relative to the travel path of the wire. In this way, one can even better control the quality of the paper produced, with respect to both the formation and the nature of its surface (printability). Differing from FIG. 4, the upper strips 58 could be supported resiliently and the lower strips 57 stationary. Another alternative could consist therein that not only the upper strips 58 but also the lower strips 57 are fastened in vertically displaceable mounts (as shown on the vacuum chamber 51). In such case, the springs 54 might possibly be eliminated.

Another difference between FIGS. 1 and 4 resides in the fact that in FIG. 4 the twin-wire zone rises in the direction of travel of the wires upwards with an inclination of, on the average, about 20° with respect to the horizontal. In this way, it is possible to keep the entire height of the twin-wire former relatively slight. In the third section III of the twin-wire zone, a flat forming shoe 23' is provided rather than a curved one, differing from FIG. 1. The separation of the upper wire 12 from the lower wire and the fiber web formed can take place, as in FIG. 1, on one of the flat suction boxes 31. Instead of this, however, the upper wire 12 can also be conducted up to the wire suction roll 20. There, as shown, it can wrap around a small part (or, alternatively, a larger part) of the circumference of the wire suction roll and then be returned via the reversing roll 19.

In the embodiment shown in FIG. 5, the twin-wire zone, as a whole, extends substantially in horizontal direction. The individual elements are substantially the same as in the embodiment of FIG. 4. However, there is the difference that the drainage strips 57 and 58 lying in the second section II of the twin-wire zone are arranged along a downwardly curved path of the twin-wire zone. Accordingly, an upwardly curved forming shoe 16, 23 is provided in the first section I and in the third section III of the twin-wire zone. This embodiment is advisable, in particular, for the modernizing of existing Fourdrinier paper machines.

The embodiments shown have the feature in common that, in the second section II of the twin-wire zone, there are present preferably n flexibly supported strips 27/57 and $n+1$ rigidly supported strips. However, it is also possible to make the number of flexibly supported strips equal to or greater by one than the number of rigidly supported strips. Instead of a rigidly supported strip, a feed or discharge edge of a drainage box can also be provided. The minimum number n

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of flexibly supported strips is two (see FIG. 4). However, three or four flexibly supported strips are preferred.

What is claimed is:

1. A method for the production of a paper web from a fiber suspension in a twin wire former comprising:

causing first and second web forming wire belts to travel along a path together to form a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, each wire belt forming an endless loop;

feeding the wire belts across a single forming roll at the start of the path through the twin wire zone;

supporting the wire belts such as to form a wedge shaped entrance slot into the twin wire zone;

supplying a fiber suspension from a headbox directly to the wedge shaped entrance slot of the twin wire zone;

draining water from the fiber suspension by means of the forming roll in order to start the forming of the web from the fiber suspension;

feeding the wire belts with the fiber suspension and the web being generated therebetween downstream of the forming roll between a plurality of first drainage strips, which are positioned within the loop of the first wire belt for contacting the first wire belt, and a plurality of second drainage strips, which are positioned within the loop of the second wire belt for contacting the second wire belt, the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship;

resiliently supporting the first drainage strips against the first wire belt that the strips contact;

rigidly supporting the second drainage strips against the second wire belt;

feeding the wire belts with the web therebetween downstream of said drainage strips across a stationary drainage element and then across a suction roll in the twin wire zone such that as the wire belts travel over the stationary drainage element and over said suction roll, water is drained through the wire belt in contact with said stationary drainage element and with said suction roll; and

maintaining the twin wire zone apart from said single forming roll and said suction roll free of rolls which would deflect the twin wire zone.

2. The method of claim 1, further comprising supplying a vacuum in the area of the second drainage strips.

3. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts which travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a single forming roll at the start of the path of the wire belts through the twin wire zone; supports which support the wire belts for forming a wedge shaped entrance slot into the first section;

a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

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said single forming roll having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the wire belts through the twin wire zone, the single forming roll being engaged by one of the wire belts and being arranged for curving the path of both wire belts around the single forming roll after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the wire belts through the twin wire zone; in the second section, a plurality of the first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; a first strip support which resiliently supports the first drainage strips against the first wire belt that the first strips contact;

a second strip support which supports the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; drainage elements in the third section, for being engaged by one of the wire belts as the wire belts travel over the drainage elements, the drainage elements including at least one stationary dewatering element followed by a suction roll and having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone apart from said single forming roll and said suction roll being free of rolls which deflect the twin wire zone.

4. The twin-wire former of claim 3, further comprising a supplier of vacuum in the area of the second drainage strips.

5. A method for the production of a paper web from a fiber suspension in a twin wire former comprising:

causing first and second web forming wire belts to travel along a path together to form a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, each wire belt forming an endless loop;

feeding the wire belts across a stationary curved forming shoe at the start of the path through the twin wire zone; supporting the wire belts such as to form a wedge shaped entrance slot into the twin wire zone;

supplying a fiber suspension from the head box directly to the wedge shaped entrance slot of the twin wire zone; draining water from the fiber suspension by means of the forming shoe in order to start the forming of the web from the fiber suspension;

feeding the wire belts with the fiber suspension and the web being generated therebetween downstream of the forming shoe between a plurality of first drainage strips, which are positioned within the loop of the first wire belt for contacting the first wire belt, and a plurality of second drainage strips, which are positioned within the loop of the second wire belt for contacting the second wire belt, the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship;

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resiliently supporting the first drainage strips against the first wire belt that the strips contact;

rigidly supporting the second drainage strips against the second wire belt;

feeding the wire belts with the web therebetween downstream of said drainage strips across a stationary drainage element and then across a suction roll in the twin wire zone such that as the wire belts travel over the stationary drainage element and the suction roll, water is drained through the wire belt in contact with said stationary drainage element and the suction roll; and maintaining the twin wire zone apart from said suction roll free of rolls which would deflect the twin wire zone.

6. The method of claim 5, further comprising supplying a vacuum in the area of the second drainage strips.

7. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts which travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a stationary curved forming shoe at the start of the path of the wire belts through the twin wire zone; supports which support the wire belts for forming a wedge shaped entrance slot into the first section;

a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

said stationary curved forming shoe having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the wire belts through the twin wire zone, the forming shoe being engaged by one of the wire belts and being arranged for curving the path of both wire belts around the forming shoe after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the wire belts through the twin wire zone; in the second section, a plurality of the first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belts; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; a first strip support which resiliently supports the first drainage strips against the first wire belt that the first strips contact;

a second strip support which supports the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a stationary drainage element followed by a suction roll in the third section, for being engaged by one of the wire belts as the wire belts travel over the stationary drainage element and said suction roll, the stationary drainage element and said suction

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roll having an open surface to enable water to be drained through the wire belt in contact therewith; and the twin wire zone apart from said suction roll being free of rolls which deflect the twin wire zone.

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8. The twin-wire former of claim 7, further comprising a supplier of vacuum in the area of the second drainage strips.

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UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 5,972,168
DATED : October 26, 1999
INVENTOR(S) : Egelhof, et. al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Please correct the first name of the 7th inventor's legal representative as follows:
[75] Else Bück, legal representative

Please add the following missing priority data:
[30] Foreign Application Priority Data
August 22, 1989 [DE] Germany....P 39 27 597.3

Please correct the Related U.S. Application Data as follows:

[62] Continuation of application No. 09/023,435, Feb. 13, 1998, which is a continuation of application No. 08/556,769, Nov. 2, 1995, Pat. No. 5,718,805, which is a continuation of application No. 08/286,948, Aug. 8, 1994, Pat. No. 5,500,091, which is a continuation of application No. 08/055,918, April 29, 1993, Pat. No. 5,389,206, which is a continuation of application No. 07/773,965, Nov. 12, 1998, abandoned, filed as application No. PCT/EP90/01313, Aug. 9, 1990.

Signed and Sealed this
Thirtieth Day of May, 2000

Attest:



Q. TODD DICKINSON

Attesting Officer

Director of Patents and Trademarks

EXHIBIT

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PART 1

[illegible]

VERIFIED BRID APPLN IS A CON OF 05/286,948 03/08/94 PAT 5,580,071
 WHICH IS A CON OF 08/054,910 04/29/93 PAT 5,389,104
 WHICH IS A CON OF 07/773,965 11/12/91 ABN

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NOTE-DISCLAIMER
The term of this patent shall not extend
beyond the expiration date
of Pat. No. 5500091

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Vermed and Acknowledged **Examiner's Initials**

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TITLE: WALL TO WALL GARBAGE

PARTS OF APPLICATION
FILED SEPARATELY

FORM PTO-1267 U.S. Department of Commerce
(Rev. 11-82) Patent and Trademark Office

DISCLAIMER LABEL

Application No. 08/556769

A terminal disclaimer has been entered and recorded under 35 U.S.C. 253 in this file.

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INTERFERENCE SEARCHED			
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SYMBOLS

- ✓ Rejected
- ~ Allowed
- (Through numeral) Canceled
- + Restricted
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- I Interference
- A Appeal
- O Objected

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PATENT APPLICATION



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US005718805A

United States Patent [19]

Egelhof et al.

[11] Patent Number: 5,718,805

[45] Date of Patent: *Feb. 17, 1998

[54] TWIN WIRE FORMER

[75] Inventors: Dieter Egelhof; Klaus Henseler, both of Heidenheim, Germany; Werner Kade, Neenah, Wis.; Albrecht Meinecke, Heidenheim, Germany; Wilhelm Wanke, Heidenheim, Germany; Hans-Jürgen Wulz, Heidenheim, Germany; Rudolf Bück, deceased, late of Heidenheim, Germany, by Elise Bück, legal representative

[73] Assignee: J. M. Voith GmbH, Heidenheim, Germany

[*] Notice: The term of this patent shall not extend beyond the expiration date of Pat. No. 5,500,091.

[21] Appl. No.: 556,769

[22] Filed: Nov. 2, 1995

Related U.S. Application Data

[63] Continuation of Ser. No. 236,948, Aug. 8, 1994, Pat. No. 5,500,091, which is a continuation of Ser. No. 35,918, Apr. 29, 1993, Pat. No. 5,389,206, which is a continuation of Ser. No. 773,965, filed as PCT/EP93/01313, Sep. 8, 1990, abandoned.

[30] Foreign Application Priority Data

Aug. 22, 1989 [DE] Germany 39 27 597.3

[51] Int. Cl.⁶ D21F 1/89

[52] U.S. Cl. 162/301; 162/300

[58] Field of Search 162/203, 300, 162/301, 303, 348, 352

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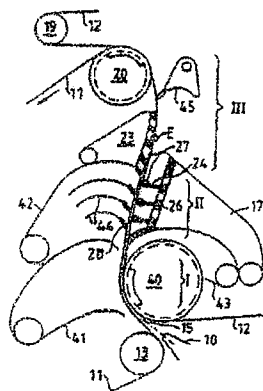
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Primary Examiner—Karen M. Hastings
Attorney, Agent, or Firm—Ostrolenk, Faber, Gerb & Soffen, LLP

[57] ABSTRACT

In a twin-wire former for the production of a paper web, two wire belts (11 and 12) together form a twin-wire zone which is divided into three sections (I, II and III). In the first section (I) the two wires (11, 12) travel over a curved forming shoe (16), or a forming roll (40). They form there a wedge-shaped inlet slot (15) with which a headbox (10) is directly associated. In the second section (II), several resiliently supported strips (27) rest against the lower wire (11) and between each of said strips (27) a rigidly mounted strip (28) rests against the upper wire (12). In the third section (III) both wire belts (11, 12) pass over another curved forming shoe (23).

5 Claims, 2 Drawing Sheets



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Fig.1

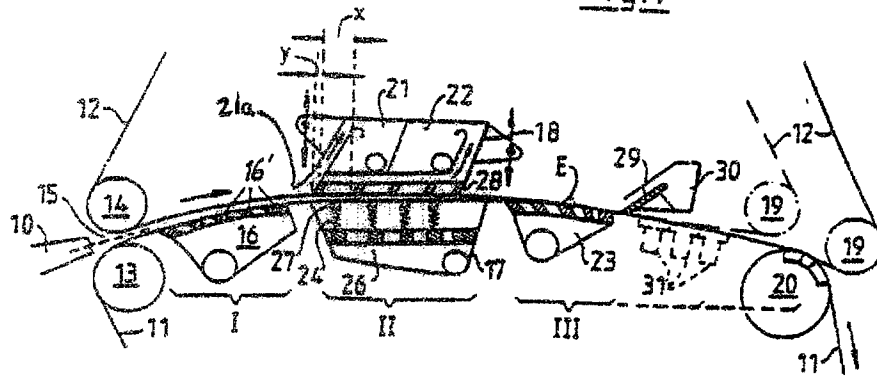


Fig.2

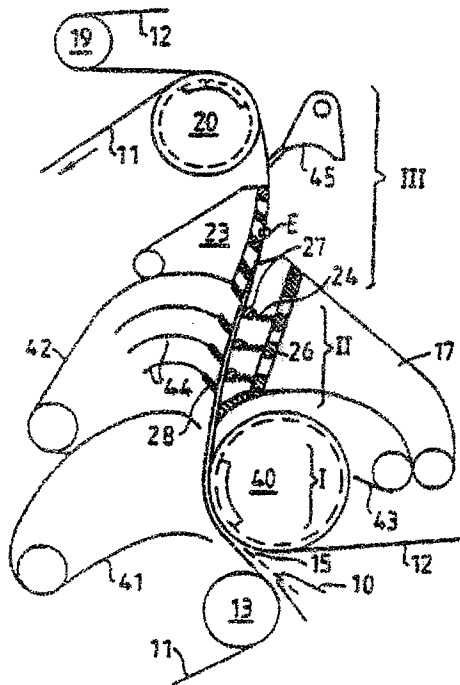
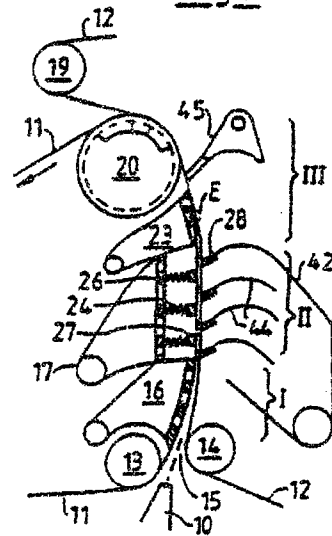


Fig.3

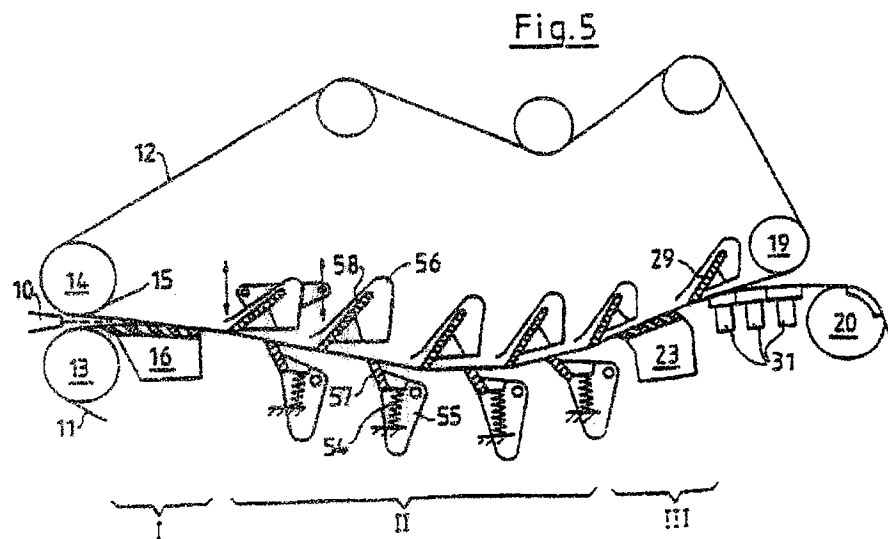
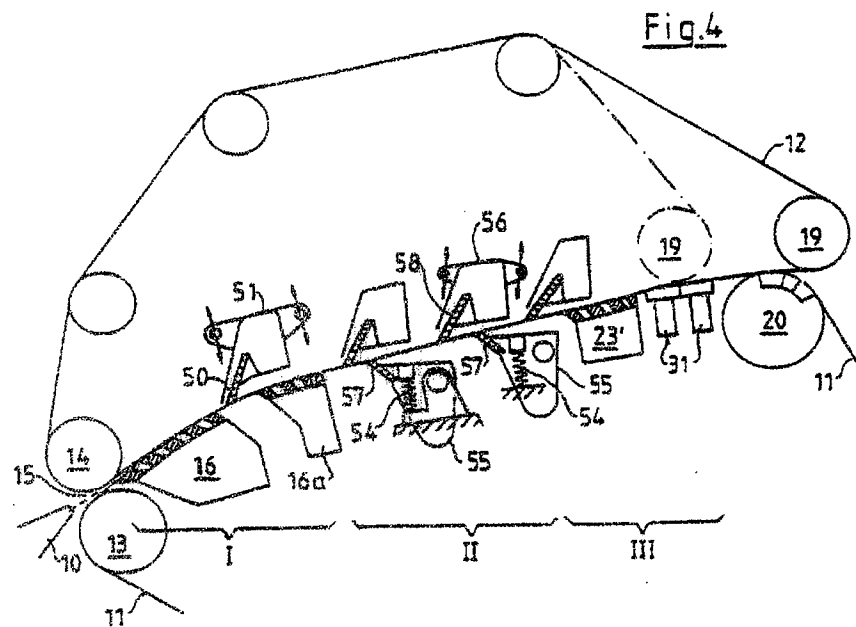


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TWIN WIRE FORMER

RELATED APPLICATIONS

This is a continuing application of, and hereby incorporates by reference the entire disclosure of, application Ser. No. 08/286,948, filed Aug. 8, 1994 now U.S. Pat. No. 5,500,091, which is a continuing application Ser. No. 08/055,918, filed Apr. 29, 1993, issued Feb. 14, 1995 as U.S. Pat. No. 5,389,206, which is a continuing application Ser. No. 07/773,965, filed as PCT/EP90/01313 Sep. 8, 1990, now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to a twin-wire former for the production of a fiber web, in particular a paper web, from a fiber suspension. The invention proceeds from the basis of the twin-wire former known from British Patent 1 125 906. The features indicated in the patent include a twin wire former for producing a fiber web and particularly a paper web from a fiber suspension. Two web forming wire belts, in the form of endless loops, travel together to form a twin wire zone. The web travels between and along the path of the wire belts through the twin wire zone. The twin wire zone has three sections and the elements in those three sections are described below. The patent describes features that state, in other words, that the forming of the fiber web from the pulp suspension fed from the headbox takes place exclusively between two wire belts. Thus, there is no so-called single-wire pre-drainage path. In a first section of the twin-wire zone, the two wire belts together form a wedge-shaped inlet slot; a jet of pulp slurry coming from the headbox discharges into it. The jet strikes the two wire belts at a place where they pass over a curved drainage element; in the case of the aforementioned British patent, this is a stationary, curved forming shoe. Its curved wire guide surface is formed of a plurality of strips with drainage slots between them. This forming shoe is followed (in a second section of the twin-wire zone) by a drainage strip arranged in the other wire loop and, behind the latter, by a drainage strip arranged in the first-mentioned wire loop (and formed by a first suction box). Finally, in a third section of the twin-wire zone there are a plurality of stationary drainage elements developed as flat suction boxes.

It has been attempted for decades with twin-wire formers of the known type to produce fiber webs (in particular, paper webs) of the highest possible quality with relatively high operating speeds. Due to the forming of the web between two wires, the result, in particular, is obtained that the final fiber web has substantially the same properties on both sides (little "two-sidedness"). However, it is difficult to obtain as uniform as possible a distribution of the fibers in the final fiber web. In other words, it is difficult to obtain a good "formation" since while the web is formed, there is always the danger that fibers will agglomerate and form floculations. Therefore, it is attempted to form a jet of pulp slurry which pulp slurry is as free as possible of floculations in the headbox (for instance, by means of a turbulence producer). It is, furthermore, endeavored so to influence the drainage of the fiber suspension during the web-forming that "refloculation" is avoided as far as possible or that, after possible floculation, a "defloculation" (i.e. a breaking up of the floculations) takes place.

It is known that a curved drainage element arranged in the first section of the twin-wire zone and, in particular, a stationary curved forming shoe developed in accordance with the aforementioned British Patent 1 125 906 counter-

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acts the danger of refloculation. This is true also of the drainage strips arranged in the British patent in the second section of the twin-wire zone. Nevertheless, the danger of refloculation is not completely eliminated in the arrangement according to said British patent. Since the number of drainage strips there is very small, a large part of the web-forming takes place in the region of the following flat-suction boxes. They, to be sure, are of high drainage capacity so that the web-forming can be completed in the region of the last flat suction boxes (i.e. the so-called main drainage zone, in which a part of the fiber material is still in the form of a suspension, terminates in the region of the flat suction box). The flat suction boxes, however, are not able to avoid refloculation or to break up floculations which have already occurred.

In order to control these last-mentioned difficulties, a web-forming device known under the name of "Duoformer D" has been developed (TAPPI proceedings 1988 annual meeting, pages 75 to 80). This known web-forming device is part of a twin-wire former which has a single-wire pre-drainage zone. In the twin-wire zone there are provided, in the one wire loop, a plurality of strips which are fixed in position but adjustably supported, namely, on the bottom of a suction box which drains in upward direction. Furthermore, a plurality of resiliently supported strips are provided in the other wire loop. By this resilience of the last-mentioned strips, the following result can be obtained: For example, upon an increase of the amount of suspension entering between the two wire belts, the flexibly supported strips can move away somewhat. In this way, the danger (which is present when only firmly supported strips are used) is eliminated of a backing up taking place in the fiber suspension in front of the strips. Such a backing up could destroy the fiber layers which have been formed up to then on the two wire belts. In other words, with this known web-forming device, a drainage pressure, once established, remains constant due to the resiliently supported strips even upon a change in the amount of suspension fed or upon a change in the drainage behavior of the fiber suspension. Therefore, automatic adaptation of the web-forming device to said changed conditions occurs.

With this known web-forming device, fiber webs of relatively good formation can also be formed. With respect to this, however, the demands have increased considerably recently, so that further improvements are desirable.

SUMMARY OF THE INVENTION

The object of the invention is so to develop a twin-wire of the aforementioned kind that the quality of the fiber web produced is further improved, particularly with respect to its formation (cloudiness), and that the twin-wire former can easily be adapted to different operating conditions (for instance, with regard to quantity and drainage behavior of the fiber suspension).

This object is achieved by the features set forth below. In particular, there is a respective drainage strip above each of the two wire belts in the second section of the twin wire zone, and at least one of the two drainage strips is supported resiliently against the respective wire belt while the other may or may not be resiliently supported, and typically is rigidly supported against the respective wire belt. Preferably, there are at least two of the drainage strips and often more against each of the wire belts. The drainage strips against one belt are offset along the path of the wire belts with respect to the drainage strips against the other belt, providing a zig zag or staggered array, and the drainage strips against at least one of the belts are resiliently supported.

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The inventors have found that a combination of known features, namely:

- A. Twin-wire former without a single-wire pre-drainage zone or at least without a single-wire pre-drainage zone of any substantial length such as to cause any appreciable pre-drainage
- B. Start of the drainage in the twin-wire zone at a preferably curved drainage element, for instance on a rotating forming cylinder or, even better, on a curved stationary forming shoe
- C. Further drainage in the twin-wire zone between strips which are arranged along a "zig-zag" line, the strips which rest against the one wire belt being resiliently supported.

leads to an extremely high increase in the quality of the finished fiber web, so that it satisfies even the highest requirements. At the same time, the twin-wire former of the invention is insensitive to changes in the amount of suspension fed and to changes in the drainage behavior of the fiber suspension. Experiments have shown that it is possible by the invention to obtain both a high increase in quality with respect to the formation and also good values with regard to the retention of fillers and fines. In contradistinction to this, in the known double-wire formers it is constantly found that there is a strong reduction in the retention upon an improvement in the formation.

It was, furthermore, found in experiments that in the second section of the twin-wire zone the number of strips can be considerably reduced as compared with the "Duo-former D". However, this number is substantially greater than in the case of the twin-wire former known from British Patent 1 125 906. It is advantageous to increase the distance between adjacent strips as compared with the "Duo-former D". In particular, the drainage strips above each one of the wire belts are of a thickness along the path of the wire belts and the spacing between adjacent strips above each wire belt is a minimum of about three times the strip thickness.

To be sure, from German OS 31 38 133, FIG. 3, a twin-wire former is known the twin-wire zone of which is provided in a first section with a curved stationary drainage element and in a second section with strips arranged along a "zig-zag" line, which strips may also be resiliently supported and there being a relatively large distance between them. However, in that case, in front of the twin-wire zone there is a single-wire pre-drainage zone in which the forming of the web starts initially only in a lower layer of the fiber suspension fed while the upper layer remains liquid and tends very strongly to flocculation. It has been found that these flakes cannot be broken up again to the desired extent in the following twin-wire zone. Another disadvantage is that the twin-wire zone is diverted by a guide roll (14b) behind the second section. This results (due to the so-called table-roller effect) in a further drainage which is uneven over the width of the web and thus in undesired variations in the quality of the web (recognizable, for instance, by disturbing longitudinal stripes).

BRIEF DESCRIPTION OF THE DRAWINGS

Other developments of the invention will be explained below with reference to embodiments which are shown in the drawing. Each of FIGS. 1 to 5 shows in simplified diagrammatic form one of the different embodiments.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The twin-wire former shown in FIG. 1 has a substantially horizontally extending twin-wire zone; this zone comprises

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three sections I, II and III arranged one behind the other. The endless wire belts (lower wire 11 and upper wire 12), shown only in part, travel in the direct vicinity of a headbox 10 over, in each case, a breast roll 13 and 14 respectively, so that the two wire belts together form a wedge-shaped entry slot 15 at the start of the twin-wire zone. The jet pulp discharged by the headbox 10 comes into contact with the two wire belts 11 and 12 only at the place where the lower wire 11 in the first section I of the twin-wire zone travels over a stationary curved forming shoe 16. The curved travel surface thereof is formed of several strips 16' with drainage slits present between them. The distance between the two breast rolls 13 and 14 is variable. The forming shoe 16 can be operated with or without vacuum. Additionally, although it is preferable that the forming shoe 16 be curved, a straight forming shoe may also be used in certain situations.

In the second section II of the twin-wire zone, the two wire belts 11 and 12 (with the partially still liquid fiber suspension present between them) travel between a lower drainage box 17 and an upper drainage box 18. In the lower drainage box 17 there are a row of at least two strips 27 (preferably of approximately rectangular cross section) which are pressed from below resiliently against the lower wire 11. For this purpose, they are supported, for instance, on springs 24 (or pneumatic pressure cushions) on a, preferably water-permeable, plate. It is obvious that the force of the springs (or of the pressure prevailing in the pressure cushions) is individually adjustable.

The upper drainage box 18 is suspended on both the front and rear ends on vertically displaceable support elements as indicated diagrammatically by double arrows. On its lower side, there is a row of at least three strips 28 of preferably parallelogram cross section which rest against the upper side of the upper wire 12 and are rigidly attached to the box 18. Above the strips 28, a front vacuum chamber 21 and a rear vacuum chamber 22 are present in the drainage box 18.

Each of the upper strips 28 scrapes off water from the wire 12. Accordingly, the amount of water scraped off decreases in the direction of flow of the wire 12 from strip to strip. The drainage water from each of the strips 28 except the drainage water scraped off by the first strip may be drained away jointly. However, it is disadvantageous to also include the drainage water from the first strip 28 since this generally would disturb the operation of the other strips. Accordingly, a vertical channel 21a is positioned in front of the first upper strip 28 to carry away or collect the water scraped off by the first strip 28.

In the region of the forming shoe 16, a part of the water of the fiber suspension is led off downward; another part penetrates due to the tension of the upper wire 12 upwards through the upper wire and is deflected by the furthest in front of the strips 28 into the front vacuum chamber 21. The water passing upward between the upper strips 28 enters into the rear vacuum chamber 22. The water penetrating between the lower strips 27 through the lower wire 11 is led off downward. Between adjacent upper drainage strips 28 there is a minimum distance X of about three times the thickness Y of the strips. The same is true of the lower resiliently supported strips 27. It is important that each of the strips 27 and 28 lies in the region of a space between two opposite strips so that a "zig-zag" arrangement (i.e. non-opposing relationship) is present. Also, as seen in FIG. 1, the first one of the strips 28 is located upstream of the first one of the strips 27. The two wires 11 and 12 preferably travel on a straight path through section II. Gentle curvature of this section of the path is, however, also possible; see FIGS. 2 and 5. Differing from FIG. 1, the resiliently supported strips

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could also be arranged in the upper box 18 and the firmly supported strips in the lower box 17. In the third section III of the twin-wire zone, both wire belts 11 and 12 travel over another preferably curved forming shoe 23 which (as shown) is arranged preferably in the lower wire loop 11. Behind it, an additional strip 29 with vacuum chamber 30 can be arranged in the loop of the upper wire 12. Furthermore, flat suction boxes 31 can be present in the loop of the lower wire. There (as is shown by dash-dot lines) the upper wire 12 can be separated by means of a guide roll 19 from the lower wire 11 and from the fiber web formed. Lower wire and fiber web then travel over a wire suction roll 20. The guide roll 19 can, however, also lie further back, so that the upper wire 12 is separated from the lower wire 11 only on the wire suction roll 20.

It is important that two drainage boxes 17 and 18 with the alternately resiliently and firmly supported ledge strips 27 and 28 lie not in the front or the rear sections but in the middle section II of the twin-wire zone, since only here can they develop their full effect, namely, intensive drainage of the fiber suspension fed while retaining the fine flocculation-free fiber distribution. This is achieved in the manner that the corresponding wire belt is imparted a slight (scarcely visible) deflection on each strip so that turbulence is constantly produced in the still liquid part of the fiber pulp. For success it is, however, also decisive that previously, in section I, a known pre-drainage towards both sides has already taken place and that this also takes place with the greatest possible retention of the flocculation-free condition of the fiber suspension.

For this two-sided pre-drainage, a stationary preferably curved forming shoe is provided in the first section I of the twin-wire zone (in accordance with FIGS. 1 and 3-5) whenever it is a question of satisfying the highest quality demands with respect to the formation. This effect of the forming shoe is due to the fact that at least the one wire belt travels polygonally from strip to strip, each strip not only leading water away but also producing turbulence in the pulp which is still liquid. With such a forming shoe, it is, however, difficult at times to obtain a stable operating condition upon the starting of the paper machine. Therefore, it may be advantageous to provide a known forming roll 40 in accordance with FIG. 2 in Section I instead of the stationary forming shoe and the breast roll lying in front of it. This possibility will be utilized when, in particular, the highest productivity is demanded from the paper manufacturing machine.

In the third section III, the aforementioned strip 29 can serve either solely to lead away water upwards or, in addition, for the further production of turbulence (for further improvement in quality). The latter is possible if a part of the fiber pulp is still in liquid condition at this place.

In FIGS. 1 to 3, the distance between the two wires 11 and 12 in the twin-wire zone has been shown greatly exaggerated. By this, it is intended to make it clear that the two wires 11 and 12 converge towards each other over a relatively long path within the twin-wire zone. This makes it clear that the process of web-forming on the first forming shoe 16 (in Section I) commences relatively slowly and is completed only in Section III. In this connection, the end of the main drainage zone in which the two wires converge towards each other (and thus, the end of the web-forming process) can lie approximately in the center of the wrapping zone of the second forming shoe 23, as is indicated, merely by way of example, in FIGS. 1 to 3. The end of the wire convergence is symbolically indicated there by the point B; the solids content of the paper web has reached there approximately

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the value of 8%. This point can, however, also lie, for instance, on one of the flat suction boxes 31. Behind this point, it is attempted further to increase the solids content, if possible even before the separation of the two wires. One goal is, namely, for the separation of the wires to take place with the highest possible solids content of the web so that as few fibers as possible are torn out of the web upon the separation. The nature and number of the drainage elements necessary for this within the twin-wire zone may, however, differ greatly and is dependent, among other things, on the type of paper and the raw-material components thereof, as well as on the operating speed.

The embodiments shown in FIGS. 2 and 3 differ from the others primarily by the fact that the twin-wire zone rises substantially vertically upward in the direction of travel of the wires. In this way, the removal of the water withdrawn from the fiber suspension is simplified since the water can be discharged relatively uniformly towards both sides. No vacuum chambers are required in particular in the central section II of the twin-wire zone. To be sure, the forming roll 40 of FIG. 2 is, as a rule, developed as a suction roll. The forming shoes 16, 23, particularly those arranged in the third section III, can, if necessary, be provided with a suction device.

Further elements of the twin-wire former shown in FIG. 2 are water-collection containers 41, 42 and 43, guide plates 44 associated with the fixed strips 28, and a water removal strip 45. The other elements are provided with the same reference numbers as the corresponding elements in FIG. 1. The same is true with regard to FIG. 3. One possible modification of FIG. 3 can consist therein that, instead of the wire suction roll 20, a forming roll is provided, and instead of the guide roll 19 the wire suction roll. A similar arrangement is known from German Utility Model 88 06 036 (Voith File: P 4539). Aside from this exception and aside from the embodiment according to FIG. 2 (with forming roll 40), the invention will, however, be used whenever possible so to design the twin-wire former that the relatively expensive forming roll (as to purchase and operation) can be dispensed with. Thus, as a rule, the wire suction roll 20 is present as the sole suction roll. Furthermore, in all embodiments of the invention it can be seen to it that no guide roll which deflects the twin-wire zone (and has the above-mentioned injurious table-roll effect) is present.

The embodiment of FIG. 4 differs from FIG. 1 among other things by the fact that, in the first section I of the twin-wire zone, a second curved stationary forming shoe 16a is arranged in the loop of the lower wire 11 behind and spaced from a first curved stationary forming shoe 16. Furthermore, in the loop of the upper wire 12 in the region between the two stationary forming shoes 16 and 16a there is provided an individual strip 50 which in known manner is part of a vacuum chamber 51. This vacuum chamber 51, similar to the upper drainage box 18 of FIG. 1, is suspended on its front and rear ends in vertically displaceable mounts. In this way, both the depth of penetration of the strip 50 into the path of travel of the upper wire 12 as well as the angle of attack of the strip 50 can be varied. With slight depth of penetration, the strip 50 serves solely for removal of water, while with greater depth of penetration it serves, in addition, for the production of turbulence in the suspension and, thus, for improvement of the formation. By the presence of two separate forming shoes 16 and 16a, the pre-drainage on both sides is temporarily interrupted; it is only continued after the strip 50 has removed from the upper wire 12 the water which has penetrated upward on the first forming shoe 16. In this way, higher operating speeds are possible.

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Another difference from FIG. 1 is that, in the second section II of the twin-wire zone, the lower, flexibly supported strips 57 and the upper, firmly supported strips 58 are developed as individual strips. This means that each strip has its own supporting body 53/56. The lower strip-supporting bodies 55 are swingably mounted, the strip 57 being pressed resiliently by the force of springs 54 against the bottom of the lower wire 11. The supporting body 56 of each of the upper strips 58 is developed as vacuum chamber in the same way as that of the strip 50. The suspension of these vacuum chambers 56 corresponds to that of the vacuum chamber 51. It is important that each of the strips 57 and 58 rest with a given force of application (corresponding to the suspension pressure) against its wire belt 11 or 12. The strips 57 and 58 are adjusted in such a manner that a slight deflection of the wire belts takes place preferably on each strip. Due to the resilient supporting of the lower strips 57, the adjustment, once effected, is insensitive to changes in the quantity or quality of pulp, so that no backing up takes place in front of the strips and, nevertheless, an effective introduction of turbulence forces into the fiber suspension takes place. In contradistinction to FIGS. 1 to 3, there is the possibility of adjusting each one of the strips 57/58 individually with respect to position in height and inclination relative to the travel path of the wire. In this way, one can even better control the quality of the paper produced, with respect to both the formation and the nature of its surface (printability). Differing from FIG. 4, the upper strips 58 could be supported resiliently and the lower strips 57 stationary. Another alternative could consist therein that not only the upper strips 58 but also the lower strips 57 are fastened in vertically displaceable mounts (as shown on the vacuum chamber 51). In such case, the springs 54 might possibly be eliminated.

Another difference between FIGS. 1 and 4 resides in the fact that in FIG. 4 the twin-wire zone rises in the direction of travel of the wires upwards with an inclination of, on the average, about 20° with respect to the horizontal. In this way, it is possible to keep the entire height of the twin-wire former relatively slight. In the third section III of the twin-wire zone, a flat forming shoe 23' is provided rather than a curved one, differing from FIG. 1. The separation of the upper wire 12 from the lower wire and the fiber web formed can take place, as in FIG. 1, on one of the flat suction boxes 31. Instead of this, however, the upper wire 12 can also be conducted up to the wire suction roll 20. There, as shown, it can wrap around a small part (or, alternatively, a larger part) of the circumference of the wire suction roll and then be returned via the reversing roll 19.

In the embodiment shown in FIG. 5, the twin-wire zone, as a whole, extends substantially in horizontal direction. The individual elements are substantially the same as in the embodiment of FIG. 4. However, there is the difference that the drainage strips 57 and 58 lying in the second section II of the twin-wire zone are arranged along a downwardly curved path of the twin-wire zone. Accordingly, an upwardly curved forming shoe 16, 23 is provided in the first section I and in the third section III of the twin-wire zone. This embodiment is advisable, in particular, for the modernizing of existing Fourdrinier paper machines.

The embodiments shown have the feature in common that, in the second section II of the twin-wire zone, there are present preferably a flexibly supported strips 27/57 and n+1 rigidly supported strips. However, it is also possible to make the number of flexibly supported strips equal to or greater by one than the number of rigidly supported strips. Instead of a rigidly supported strip, a feed or discharge edge of a drainage box can also be provided. The minimum number n

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of flexibly supported strips is two (see FIG. 4). However, three or four flexibly supported strips are preferred.

What is claimed is:

1. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:
first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;
each wire belt forming an endless loop;
the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;
the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;
second support means supporting the second drainage strips rigidly against the second wire belt;
first means for collecting the water drained from the fiber suspension by the most upstream, one of the drainage strips;
second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and
the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the twin wire zone being free of rolls which deflect the twin wire zone.
2. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:
first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;
each wire belt forming an endless loop;
the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber sus-

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pension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone; the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt;

first means for collecting the water drained from the fiber suspension by the most upstream one of the drainage strips;

second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the twin wire zone being free of any forming rolls.

3. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising: first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips;

second support means supporting the second drainage strips rigidly against the second wire belt;

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the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone being free of rolls which deflect the twin wire zone.

4. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising: first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips;

second support means supporting the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element; and

the twin wire zone being free of any forming rolls.

5. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a single first drainage element at the start of the path

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through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone; said single first drainage element in the first section being a single forming roll having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the belts through the twin wire zone, the single forming roll being engaged by one of the wire belts for curving the path of the belts around the single forming roll after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts

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with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt; and

means for supplying a vacuum in the area of the second drainage strips;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section, for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone apart from said single forming roll being free of rolls which deflect the twin wire zone.

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TWIN WIRE FORMER

RELATED APPLICATIONS

This is a continuing application of, and hereby
 5 incorporates by reference the entire disclosure of, application
 Serial No. 08/286,948, filed August 8, 1994 now pending, which is
 a continuing application Serial No. 08/055,918, filed April 29,
 1993, issued February 14, 1995 as Patent 5,389,206, which is a
 continuing application Serial No. 07/773,965, filed November 12,
 10 1991, now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to a twin-wire former for
 the production of a fiber web, in particular a paper web, from a
 fiber suspension. The invention proceeds from the basis of the
 15 twin-wire former known from British Patent 1 125 906. The
 features indicated in the patent include a twin wire former for
 producing a fiber web and particularly a paper web from a fiber
 suspension. Two web forming wire belts, in the form of endless
 loops, travel together to form a twin wire zone. The web travels
 20 between and along the path of the wire belts through the twin
 wire zone. The twin wire zone has three sections and the elements
 in those three sections are described below. The patent describes
 features that state, in other words, that the forming of the
 fiber web from the pulp suspension fed from the headbox takes
 25 place exclusively between two wire belts. Thus, there is no
 so-called single-wire pre-drainage path. In a first section of
 the twin-wire zone, the two wire belts together form a
 wedge-shaped inlet slot; a jet of pulp slurry coming from the
 headbox discharges into it. The jet strikes the two wire belts at
 30 a place where they pass over a curved drainage element; in the
 case of the aforementioned British patent, this is a stationary,
 curved forming shoe. Its curved wire guide surface is formed of a
 plurality of strips with drainage slots between them. This

forming shoe is followed (in a second section of the twin-wire zone) by a drainage strip arranged in the other wire loop and, behind the latter, by a drainage strip arranged in the first-mentioned wire loop (and formed by a first suction box).
5 Finally, in a third section of the twin-wire zone there are a plurality of stationary drainage elements developed as flat suction boxes.

It has been attempted for decades with twin-wire formers of the known type to produce fiber webs (in particular, paper webs) of the highest possible quality with relatively high
10 operating speeds. Due to the forming of the web between two wires, the result, in particular, is obtained that the final fiber web has substantially the same properties on both sides (little "two-sidedness"). However, it is difficult to obtain as
15 uniform as possible a distribution of the fibers in the final fiber web. In other words, it is difficult to obtain a good "formation" since while the web is formed, there is always the danger that fibers will agglomerate and form flocculations. Therefore, it is attempted to form a jet of pulp slurry which
20 pulp slurry is as free as possible of flocculations in the headbox (for instance, by means of a turbulence producer). It is, furthermore, endeavored so to influence the drainage of the fiber suspension during the web-forming that "reflocculation" is avoided as far as possible or that, after possible flocculation,
25 a "deflocculation" (i.e. a breaking up of the flocculations) takes place.

It is known that a curved drainage element arranged in the first section of the twin-wire zone and, in particular, a stationary curved forming shoe developed in accordance with the
30 aforementioned British Patent 1 125 906 counteracts the danger of reflocculation. This is true also of the drainage strips arranged in the British Patent in the second section of the twin-wire zone. Nevertheless, the danger of reflocculation is not completely eliminated in the arrangement according to said
35 British Patent. Since the number of drainage strips there is very small, a large part of the web-forming takes place in the region

of the following flat-suction boxes. They, to be sure, are of high drainage capacity so that the web-forming can be completed in the region of the last flat suction boxes (i.e. the so-called main drainage zone, in which a part of the fiber material is still in the form of a suspension, terminates in the region of the flat suction box). The flat suction boxes, however, are not able to avoid reflocculation or to break up flocculations which have already occurred.

In order to control these last-mentioned difficulties, a web-forming device known under the name of "Duoformer D" has been developed (TAPPI Proceedings 1988 annual meeting, pages 75 to 80). This known web-forming device is part of a twin-wire former which has a single-wire pre-drainage zone. In the twin-wire zone there are provided, in the one wire loop, a plurality of strips which are fixed in position but adjustably supported, namely, on the bottom of a suction box which drains in upward direction. Furthermore, a plurality of resiliently supported strips are provided in the other wire loop. By this resilience of the last-mentioned strips, the following result can be obtained: For example, upon an increase of the amount of suspension entering between the two wire belts, the flexibly supported strips can move away somewhat. In this way, the danger (which is present when only firmly supported strips are used) is eliminated of a backing up taking place in the fiber suspension in front of the strips. Such a backing up could destroy the fiber layers which have been formed up to then on the two wire belts. In other words, with this known web-forming device, a drainage pressure, once established, remains constant due to the resiliently supported strips even upon a change in the amount of suspension fed or upon a change in the drainage behavior of the fiber suspension. Therefore, automatic adaptation of the web-forming device to said changed conditions occurs.

With this known web-forming device, fiber webs of relatively good formation can also be formed. With respect to this, however, the demands have increased considerably recently, so that further improvements are desirable.

SUMMARY OF THE INVENTION

The object of the invention is so to develop a twin-wire of the aforementioned kind that the quality of the fiber web produced is further improved, particularly with respect to its formation (cloudiness), and that the twin-wire former can easily be adapted to different operating conditions (for instance, with regard to quantity and drainage behavior of the fiber suspension).

This object is achieved by the features set forth below. In particular, there is a respective drainage strip above each of the two wire belts in the second section of the twin wire zone, and at least one of the two drainage strips is supported resiliently against the respective wire belt while the other may or may not be resiliently supported, and typically is rigidly supported against the respective wire belt. Preferably, there are at least two of the drainage strips and often more against each of the wire belts. The drainage strips against one belt are offset along the path of the wire belts with respect to the drainage strips against the other belt, providing a zig zag or staggered array, and the drainage strips against at least one of the belts are resiliently supported.

The inventors have found that a combination of known features, namely:

- A. Twin-wire former without a single-wire pre-drainage zone or at least without a single-wire pre-drainage zone of any substantial length such as to cause any appreciable pre-drainage
- B. Start of the drainage in the twin-wire zone at a preferably curved drainage element, for instance on a rotating forming cylinder or, even better, on a curved stationary forming shoe
- C. Further drainage in the twin-wire zone between strips which are arranged along a "zig-zag" line, the strips which rest against the one wire belt being resiliently supported,

leads to an extremely high increase in the quality of the finished fiber web, so that it satisfies even the highest requirements. At the same time, the twin-wire former of the invention is insensitive to changes in the amount of suspension fed and to changes in the drainage behavior of the fiber suspension. Experiments have shown that it is possible by the invention to obtain both a high increase in quality with respect to the formation and also good values with regard to the retention of fillers and fines. In contradistinction to this, in the known double-wire formers it is constantly found that there is a strong reduction in the retention upon an improvement in the formation.

It was, furthermore, found in experiments that in the second section of the twin-wire zone the number of strips can be considerably reduced as compared with the "Duoformer D". However, this number is substantially greater than in the case of the twin-wire former known from British Patent 1 125 906. It is advantageous to increase the distance between adjacent strips as compared with the "Duoformer D". In particular, the drainage strips above each one of the wire belts are of a thickness along the path of the wire belts and the spacing between adjacent strips above each wire belt is a minimum of about three times the strip thickness.

To be sure, from German OS 31 38 133, FIG. 3, a twin-wire former is known the twin-wire zone of which is provided in a first section with a curved stationary drainage element and in a second section with strips arranged along a "zig-zag" line, which strips may also be resiliently supported and there being a relatively large distance between them. However, in that case, in front of the twin-wire zone there is a single-wire pre-drainage zone in which the forming of the web starts initially only in a lower layer of the fiber suspension fed while the upper layer remains liquid and tends very strongly to flocculation. It has been found that these flakes cannot be broken up again to the desired extent in the following twin-wire zone. Another disadvantage is that the twin-wire zone is diverted by a guide

roll (14b) behind the second section. This results (due to the so-called table-roll effect) in a further drainage which is uneven over the width of the web and thus in undesired variations in the quality of the web (recognizable, for instance, by disturbing longitudinal stripes).

BRIEF DESCRIPTION OF THE DRAWINGS

Other developments of the invention will be explained below with reference to embodiments which are shown in the drawing. Each of FIGS. 1 to 5 shows in simplified diagrammatic form one of the different embodiments.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The twin-wire former shown in FIG. 1 has a substantially horizontally extending twin-wire zone; this zone comprises three sections I, II and III arranged one behind the other. The endless wire belts (lower wire 11 and upper wire 12), shown only in part, travel in the direct vicinity of a headbox 10 over, in each case, a breast roll 13 and 14 respectively, so that the two wire belts together form a wedge-shaped entry slot 15 at the start of the twin-wire zone. The jet pulp discharged by the headbox 10 comes into contact with the two wire belts 11 and 12 only at the place where the lower wire 11 in the first section I of the twin-wire zone travels over a stationary curved forming shoe 16. The curved travel surface thereof is formed of several strips 16' with drainage slits present between them. The distance between the two breast rolls 13 and 14 is variable. The forming shoe 16 can be operated with or without vacuum. Additionally, although it is preferable that the forming shoe 16 be curved, a straight forming shoe may also be used in certain situations.

In the second section II of the twin-wire zone, the two wire belts 11 and 12 (with the partially still liquid fiber suspension present between them) travel between a lower drainage box 17 and an upper drainage box 18. In the lower drainage box 17 there are a row of at least two strips 27 (preferably of approximately rectangular cross section) which are pressed from

below resiliently against the lower wire 11. For this purpose, they are supported, for instance, on springs 24 (or pneumatic pressure cushions) on a, preferably water-permeable, plate. It is obvious that the force of the springs (or of the pressure prevailing in the pressure cushions) is individually adjustable.

The upper drainage box 18 is suspended on both the front and rear ends on vertically displaceable support elements as indicated diagrammatically by double arrows. On its lower side, there is a row of at least three strips 28 of preferably parallelogram cross section which rest against the upper side of the upper wire 12 and are rigidly attached to the box 18. Above the strips 28, a front vacuum chamber 21 and a rear vacuum chamber 22 are present in the drainage box 18.

Each of the upper strips 28 scrapes off water from the wire 12. Accordingly, the amount of water scraped off decreases in the direction of flow of the wire 12 from strip to strip. The drainage water from each of the strips 28 except the drainage water scraped off by the first strip may be drained away jointly. However, it is disadvantageous to also include the drainage water from the first strip 28 since this generally would disturb the operation of the other strips. Accordingly, a vertical channel 21a is positioned in front of the first upper strip 28 to carry away or collect the water scraped off by the first strip 28.

In the region of the forming shoe 16, a part of the water of the fiber suspension is led off downward; another part penetrates due to the tension of the upper wire 12-upwards through the upper wire and is deflected by the furthest in front of the strips 28 into the front vacuum chamber 21. The water passing upward between the upper strips 28 enters into the rear vacuum chamber 22. The water penetrating between the lower strips 27 through the lower wire 11 is led off downward. Between adjacent upper drainage strips 28 there is a minimum distance X of about three times the thickness Y of the strips. The same is true of the lower resiliently supported strips 27. It is important that each of the strips 27 and 28 lies in the region of a space between two opposite strips so that a "zig-zag"

arrangement (i.e. non-opposing relationship) is present. Also, as seen in FIG. 1, the first one of the strips 28 is located upstream of the first one of the strips 27. The two wires 11 and 12 preferably travel on a straight path through section II.

5 Gentle curvature of this section of the path is, however, also possible; see FIGS. 2 and 5. Differing from FIG. 1, the resiliently supported strips could also be arranged in the upper box 18 and the firmly supported strips in the lower box 17. In the third section III of the twin-wire zone, both wire belts 11 and 12 travel over another preferably curved forming shoe 23
10 which (as shown) is arranged preferably in the lower wire loop 11. Behind it, an additional strip 29 with vacuum chamber 30 can be arranged in the loop of the upper wire 12. Furthermore, flat suction boxes 31 can be present in the loop of the lower wire. There (as is shown by dash-dot lines) the upper wire 12 can be
15 separated by means of a guide roll 19 from the lower wire 11 and from the fiber web formed. Lower wire and fiber web then travel over a wire suction roll 20. The guide roll 19 can, however, also lie further back, so that the upper wire 12 is separated from the
20 lower wire 11 only on the wire suction roll 20.

It is important that two drainage boxes 17 and 18 with the alternately resiliently and firmly supported ledge strips 27 and 28 lie not in the front or the rear sections but in the middle section II of the twin-wire zone, since only here can they
25 develop their full effect, namely, intensive drainage of the fiber suspension fed while retaining the fine flocculation-free fiber distribution. This is achieved in the manner that the corresponding wire belt is imparted a slight (scarcely visible) deflection on each strip so that turbulence is constantly
30 produced in the still liquid part of the fiber pulp. For success it is, however, also decisive that previously, in section I, a known pre-drainage towards both sides has already taken place and that this also takes place with the greatest possible retention of the flocculation-free condition of the fiber suspension.

35 For this two-sided pre-drainage, a stationary preferably curved forming shoe is provided in the first section I

of the twin-wire zone (in accordance with FIGS. 1 and 3-5) whenever it is a question of satisfying the highest quality demands with respect to the formation. This effect of the forming shoe is due to the fact that at least the one wire belt travels polygonally from strip to strip, each strip not only leading water away but also producing turbulence in the pulp which is still liquid. With such a forming shoe, it is, however, difficult at times to obtain a stable operating condition upon the starting of the paper machine. Therefore, it may be advantageous to provide a known forming roll 40 in accordance with FIG. 2 in Section I instead of the stationary forming shoe and the breast roll lying in front of it. This possibility will be utilized when, in particular, the highest productivity is demanded from the paper manufacturing machine.

In the third section III, the aforementioned strip 29 can serve either solely to lead away water upwards or, in addition, for the further production of turbulence (for further improvement in quality). The latter is possible if a part of the fiber pulp is still in liquid condition at this place.

In FIGS. 1 to 3, the distance between the two wires 11 and 12 in the twin-wire zone has been shown greatly exaggerated. By this, it is intended to make it clear that the two wires 11 and 12 converge towards each other over a relatively long path within the twin-wire zone. This makes it clear that the process of web-forming on the first forming shoe 16 (in Section I) commences relatively slowly and is completed only in Section III. In this connection, the end of the main drainage zone in which the two wires converge towards each other (and thus, the end of the web-forming process) can lie approximately in the center of the wrapping zone of the second forming shoe 23, as is indicated, merely by way of example, in FIGS. 1 to 3. The end of the wire convergence is symbolically indicated there by the point E; the solids content of the paper web has reached there approximately the value of 8%. This point can, however, also lie, for instance, on one of the flat suction boxes 31. Behind this point, it is attempted further to increase the solids content, if possible

even before the separation of the two wires. One goal is, namely, for the separation of the wires to take place with the highest possible solids content of the web so that as few fibers as possible are torn out of the web upon the separation. The nature and number of the drainage elements necessary for this within the twin-wire zone may, however, differ greatly and is dependent, among other things, on the type of paper and the raw-material components thereof, as well as on the operating speed.

The embodiments shown in FIGS. 2 and 3 differ from the others primarily by the fact that the twin-wire zone rises substantially vertically upward in the direction of travel of the wires. In this way, the removal of the water withdrawn from the fiber suspension is simplified since the water can be discharged relatively uniformly towards both sides. No vacuum chambers are required in particular in the central section II of the twin-wire zone. To be sure, the forming roll 40 of FIG. 2 is, as a rule, developed as a suction roll. The forming shoes 16, 23, particularly those arranged in the third section III, can, if necessary, be provided with a suction device.

Further elements of the twin-wire former shown in FIG. 2 are water-collection containers 41, 42 and 43, guide plates 44 associated with the fixed strips 28, and a water removal strip 45. The other elements are provided with the same reference numbers as the corresponding elements in FIG. 1. The same is true with regard to FIG. 3. One possible modification of FIG. 3 can consist therein that, instead of the wire suction roll 20, a forming roll is provided, and instead of the guide roll 19 the wire suction roll. A similar arrangement is known from German Utility Model 88 06 036 (Voith File: P 4539). Aside from this exception and aside from the embodiment according to FIG. 2 (with forming roll 40), the invention will, however, be used whenever possible-so to design the twin-wire former that the relatively expensive forming roll (as to purchase and operation) can be dispensed with. Thus, as a rule, the wire suction roll 20 is present as the sole suction roll. Furthermore, in all embodiments of the invention it can be seen to it that no guide roll which

deflects the twin-wire zone (and has the above-mentioned injurious table-roll effect) is present.

The embodiment of FIG. 4 differs from FIG. 1 among other things by the fact that, in the first section I of the twin-wire zone, a second curved stationary forming shoe 16a is arranged in the loop of the lower wire 11 behind and spaced from a first curved stationary forming shoe 16. Furthermore, in the loop of the upper wire 12 in the region between the two stationary forming shoes 16 and 16a there is provided an individual strip 50 which in known manner is part of a vacuum chamber 51. This vacuum chamber 51, similar to the upper drainage box 18 of FIG. 1, is suspended on its front and rear ends in vertically displaceable mounts. In this way, both the depth of penetration of the strip 50 into the path of travel of the upper wire 12 as well as the angle of attack of the strip 50 can be varied. With slight depth of penetration, the strip 50 serves solely for removal of water, while with greater depth of penetration it serves, in addition, for the production of turbulence in the suspension and, thus, for improvement of the formation. By the presence of two separate forming shoes 16 and 16a, the pre-drainage on both sides is temporarily interrupted; it is only continued after the strip 50 has removed from the upper wire 12 the water which has penetrated upward on the first forming shoe 16. In this way, higher operating speeds are possible.

Another difference from FIG. 1 is that, in the second section II of the twin-wire zone, the lower, flexibly supported strips 57 and the upper, firmly supported strips 58 are developed as individual strips. This means that each strip has its own supporting body 55/56. The lower strip-supporting bodies 55 are swingably mounted, the strip 57 being pressed resiliently by the force of springs 54 against the bottom of the lower wire 11. The supporting body 56 of each of the upper strips 58 is developed as vacuum chamber in the same way as that of the strip 50. The suspension of these vacuum chambers 56 corresponds to that of the vacuum chamber 51. It is important that each of the strips 57 and

58 rest with a given force of application (corresponding to the suspension pressure) against its wire belt 11 or 12. The strips 57 and 58 are adjusted in such a manner that a slight deflection of the wire belts takes place preferably on each strip. Due to the resilient supporting of the lower strips 57, the adjustment, once effected, is insensitive to changes in the quantity or quality of pulp, so that no backing up takes place in front of the strips and, nevertheless, an effective introduction of turbulence forces into the fiber suspension takes place. In contradistinction to FIGS. 1 to 3, there is the possibility of adjusting each one of the strips 57/58 individually with respect to position in height and inclination relative to the travel path of the wire. In this way, one can even better control the quality of the paper produced, with respect to both the formation and the nature of its surface (printability). Differing from FIG. 4, the upper strips 58 could be supported resiliently and the lower strips 57 stationary. Another alternative could consist therein that not only the upper strips 58 but also the lower strips 57 are fastened in vertically displaceable mounts (as shown on the vacuum chamber 51). In such case, the springs 54 might possibly be eliminated.

Another difference between FIGS. 1 and 4 resides in the fact that in FIG. 4 the twin-wire zone rises in the direction of travel of the wires upwards with an inclination of, on the average, about 20° with respect to the horizontal. In this way, it is possible to keep the entire height of the twin-wire former relatively slight. In the third section III of the twin-wire zone, a flat forming shoe 23' is provided rather than a curved one, differing from FIG. 1. The separation of the upper wire 12 from the lower wire and the fiber web formed can take place, as in FIG. 1, on one of the flat suction boxes 31. Instead of this, however, the upper wire 12 can also be conducted up to the wire suction roll 20. There, as shown, it can wrap around a small part (or, alternatively, a larger part) of the circumference of the wire suction roll and then be returned via the reversing roll 19.

In the embodiment shown in FIG. 5, the twin-wire zone,

as a whole, extends substantially in horizontal direction. The individual elements are substantially the same as in the embodiment of FIG. 4. However, there is the difference that the drainage strips 57 and 58 lying in the second section II of the twin-wire zone are arranged along a downwardly curved path of the twin-wire zone. Accordingly, an upwardly curved forming shoe 16, 23 is provided in the first section I and in the third section III of the twin-wire zone. This embodiment is advisable, in particular, for the modernizing of existing Fourdrinier paper machines.

The embodiments shown have the feature in common that, in the second section II of the twin-wire zone, there are present preferably n flexibly supported strips 27/57 and $n + 1$ rigidly supported strips. However, it is also possible to make the number of flexibly supported strips equal to or greater by one than the number of rigidly supported strips. Instead of a rigidly supported strip, a feed or discharge edge of a drainage box can also be provided. The minimum number n of flexibly supported strips is two (see FIG. 4). However, three or four flexibly supported strips are preferred.

CLAIMS

What is claimed is:

1. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone of a substantial length;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt, ~~that the strips contact~~ that strip contacts;

second support means supporting the second drainage strips rigidly against the second wire belt;

first means for collecting the water drained from the fiber suspension by the most upstream one of the drainage strips;

35 second means separate from the first means for
collecting the water drained from the fiber suspension by all of
the other drainage strips; and
the twin wire zone having a third section following the
second section along the path of the wire belts through the twin
wire zone; a second drainage element in the third section for
40 being engaged by one of the wire belts as the wire belts travel
over the second drainage element.

2. The twin wire former of claim 1, wherein the first
drainage element is stationary.

3. The twin wire former of claim 2, wherein the first
45 drainage element is curved and is engaged by one of the wire
belts for curving the path of the belts around the curved
drainage element after the entrance of the suspension into the
entrance slot.

4. The twin wire former of claim 3, wherein the first
drainage element has an open surface to enable drainage of water
from the fiber suspension.

~~5. The twin wire former of claim 1, wherein the twin
wire zone is free of rolls which deflect the twin wire zone.~~

~~6. The twin wire former of claim 1, wherein the twin
wire zone is free of any forming rolls.~~

~~7. The twin wire former of claim 1, wherein the first
drainage strips are located within the same wire belt loop as the
first drainage element and the second drainage strips are located
within the other wire belt group.~~

~~8. The twin wire former of claim 7, wherein the first
one of the second drainage strips is located upstream of the
first one of the first drainage strips and the last one of the~~

second drainage strips is located downstream of the last one of the first drainage strips.

9. The twin wire former of claim 1, further comprising means for supplying a vacuum in the area of the second drainage strips.

10. The twin wire former of claim 1, wherein each of the drainage strips has a respective thickness in the direction along the path through the twin wire zone; neighboring ones of the first drainage strips are spaced a minimum distance of about three times the respective first strip thickness, and neighboring ones of the second drainage strips are also spaced a minimum distance of about three times the respective second strip thickness.

11. The twin wire former of claim 1, wherein the support means for the second drainage strips include means enabling adjustment of the position of the second drainage strips relative to the second wire belt to set the initial rigid position thereof.

12. The twin wire former of claim 11, wherein the support means for the second drainage strips comprise a support body to which the second drainage strips are supported, and bearings on which the support body is supported for enabling displacement of the support body across the path of the wire belts through the second section.

13. The twin wire former of claim 1, wherein the first and second support means comprise a respective individual support body supporting each of at least one of the first and second drainage strips individually, and means supporting the respective support body for each strip to be displaceable for enabling displacement of the respective strip transverse to the direction of the path of the wire belts.

14. The twin wire former of claim 1, wherein the first and second support means comprise a respective individual support body supporting each of the first and second drainage strips individually and means further supporting the respective support body of at least one of the first and second strips for enabling said at least one strip to be moved transverse to the direction of the path of the wire belts.

15. The twin wire former of claim 1, further comprising a curved stationary forming shoe in the first section of the twin wire zone and following after and spaced from the ~~first~~ ^{first} drainage element along the path of the wire belts through the first section;

a first ~~section~~ ^{suction} strip disposed at the second wire belt and in the space between the ~~curved~~ ^{first} drainage element and the curved stationary forming shoe in the first section of the twin wire zone along the path of the wire belts through the twin wire zone for enabling removal of water from the second wire belt.

16. The twin wire former of claim 1, wherein the second drainage element in the ~~third~~ ^{first} section of the twin wire zone is stationary.

17. The twin wire former of claim 16, wherein the second drainage element is curved.

18. The twin wire former of claim 17, wherein the second drainage element has a curvature that is curved in the same direction as the curvature of the curved drainage element in the first section of the twin wire zone.

19. The twin wire former of claim 18, further comprising an additional strip in the third section of the twin wire zone following the second drainage element and disposed against the other wire belt than the stationary drainage element.

20. The twin wire former of claim 18, wherein the first drainage element in the first section of the twin wire zone and the second drainage element in the third section of the twin wire zone are arranged against the same one of the first and second wire belts.

21. The twin wire former of claim 1, further comprising a suction roll at one of the wire belts and located after the ^{second} first drainage element along the path of the wire belts; both of the wire belts being wrapped about part of the circumference of the suction roll.

22. The twin wire former of claim 1, wherein the means for directing the wire belts are positioned so that the twin wire zone rises substantially vertically upwardly in the path of travel of the wire belts through the twin wire zone.

23. The twin wire former of claim 1, wherein the means for directing the wire belts are positioned so that the twin wire zone rises gradually upwardly along the path of travel of the wire belts through the twin wire zone at an incline with respect to the horizontal in the range of about 10° to 30°.

24. The twin wire former of claim 1, wherein the first and the second drainage strips in the second section of the twin wire zone are both arranged one after the other along the path of the wire belts through the twin wire zone so as to define a curvature for the path of the wire belts through the second section.

25. The twin wire former of claim ²⁴ 1, wherein the first and second drainage strips are positioned in the second section of the twin wire zone to define a curvature for the path of the wire belts through the second section of the twin wire zone that is opposite the curvature of the curved drainage element in the first section of the twin wire zone.

26. The twin wire former of claim 1, wherein the means for directing the wire belts are positioned so that the twin wire zone extends substantially horizontally;

the first drainage element in the first section of the twin wire zone being generally curved upwardly for giving the path of the wire belts through the first section of the twin wire zone a generally upward curve; the first and second drainage strips in the second section of the twin wire zone being so positioned as to give the wire belts a generally downward curvature through at least part of the second section of the twin wire zone and the stationary drainage element in the third section of the twin wire zone is curved in a direction to give the wire belts passing through the third section of the twin wire zone a generally upward curvature.

~~Second~~ 27. The twin wire former of claim 1, wherein the stationary drainage element is curved.

~~Second~~ 28. The twin wire former of claim 1, wherein the stationary drainage element includes means for providing suction thereto to facilitate drainage of water.

~~132~~ 29. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone of a substantial length;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and

15 directed for delivering fiber suspension from the headbox to the
wedge shaped entrance slot of the first section of the twin wire
zone;

the twin wire zone having a second section following
the first section along the path of the belts through the twin
20 wire zone; in the second section, a plurality of first drainage
strips are positioned within the loop of the first wire belt and
are for contacting the first wire belt; in the second section, a
plurality of second drainage strips are positioned within the
loop of the second wire belt and are for contacting the second
25 wire belt; the first strips being shifted in position along the
path of the wire belts with respect to the second strips so that
the first and second strips are offset and in a non-opposing
relationship; first support means for resiliently supporting the
first drainage strips against the respective wire belt that the strips
30 contact, the last one of the second drainage strips being
located downstream of the last one of the first drainage strips;

second support means supporting the second drainage
strips rigidly against the second wire belt;

the twin wire zone having a third section following the
35 second section along the path of the wire belts through the twin
wire zone; a ^{second} drainage element in the third section for being
engaged by one of the wire belts as the wire belts travel over
the ^{second} drainage element, the ^{second} drainage element having an open surface
to enable water to be drained through the wire belt in contact
40 therewith; and

the twin wire zone being free of rolls which deflect
the twin wire zone.

30. A twin-wire former for the production of a paper
web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for
directing the wire belts to travel along a path together for
5 forming a twin wire zone of the twin wire former, with the web
between the wire belts as the wire belts travel along the path

through the twin wire zone, neither wire belt defining a single wire predrainage zone of a substantial length;

each wire belt forming an endless loop;

10 the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and
15 directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

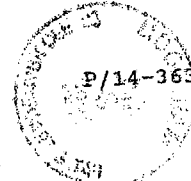
the twin wire zone having a second section following the first section along the path of the belts through the twin
20 wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second
25 wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that ^{the} strip
30 contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips;

second support means supporting the second drainage strips rigidly against the second wire belt;

35 the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; ^{second} a drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the ^{second} stationary drainage element; and

the twin wire zone being free of any forming rolls.

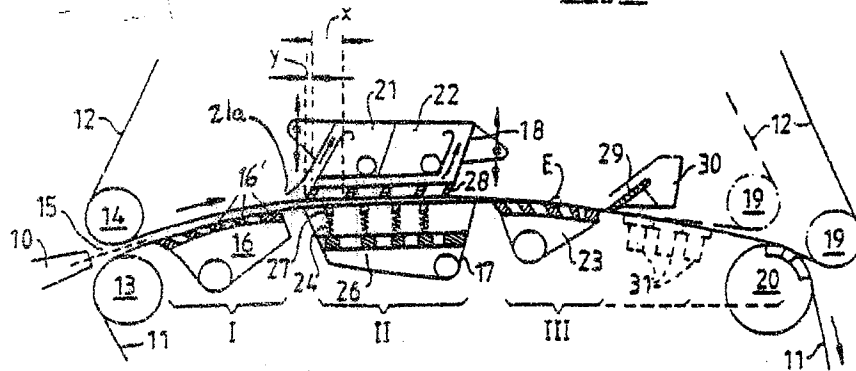
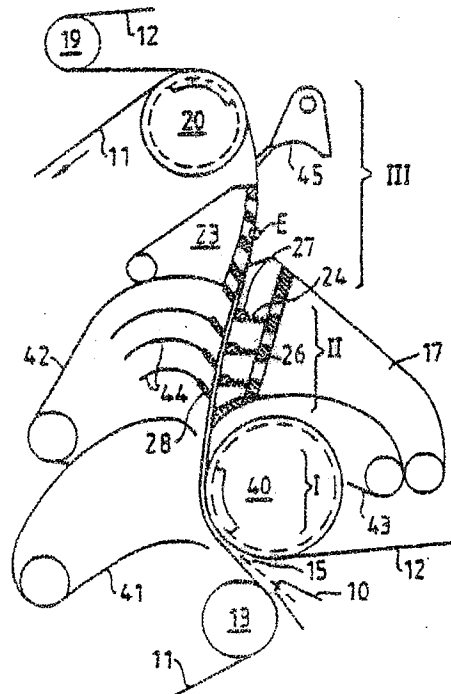
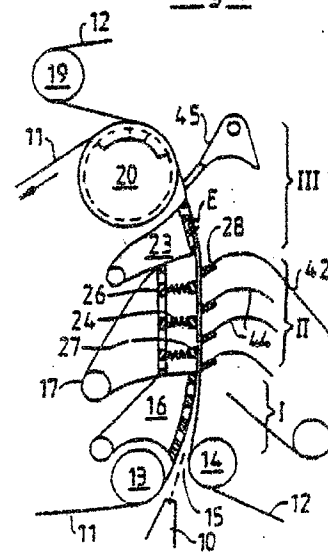
08/556769



ABSTRACT OF THE DISCLOSURE

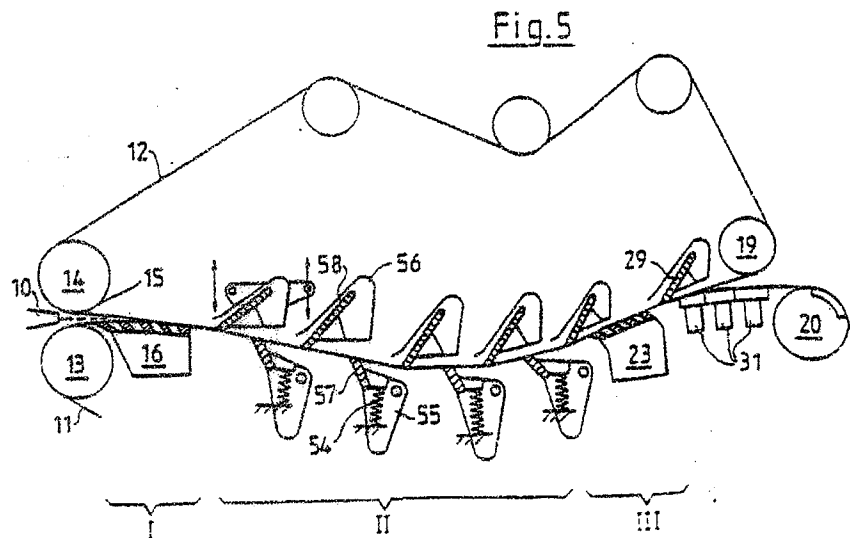
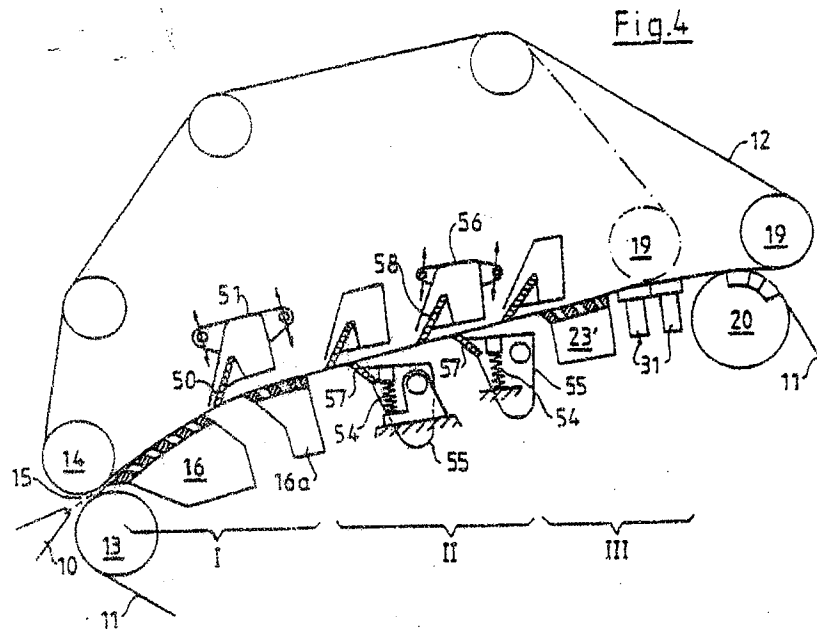
5
KMA
10
In a twin-wire former for the production of a paper web, two wire belts (11 and 12) together form a twin-wire zone which is divided into three sections (I, II and III). In the first section (I) the two wires (11, 12) travel over a curved forming shoe (16). They form there a wedge-shaped inlet slot (15) with which a headbox (10) is directly associated. In the second section (II), several resiliently supported strips (27) rest against the lower wire (11) and between each of said strips (27) a rigidly mounted strip (28) rests against the upper wire (12). In the third section (III) both wire belts (11, 12) pass over another curved forming shoe (23).

PRINT OF DRAWINGS
AS ORIGINALLY FILED

Fig.1Fig.2Fig.3

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08/556769





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Hon. Commissioner of Patents and Trademarks
Washington, DC 20231

OPGS File No. : P/14-363 1-00
Inventor : Rudolf BUCK et al.
Title : TWIN WIRE FORMER
Assignee : J.M. Voith GmbH

Enclosed herewith please find the following documents in the above-identified application for United States Letters Patent:

XX Abstract
13 Pages of Specification
30 Numbered Claims Calculated as 30 Claims for Fee Purposes
2 Sheets of Drawing Containing Figures 1 to 5.
Declaration and Power of Attorney
XX Priority is Claimed under 35 U.S.C. §119:
Convention Date August 22, 1989 for German Appln. S.N. P 39 27 597.3
Certified Priority Application
Verified Statement Claiming Small Entity Status under 37 C.F.R. §1.27.
Assignment
XX Return-Addressed Post Card

OPGS Check No. 532/1, which includes the fee of \$970.00, calculated as follows:

Basic Filing Fee:	\$ 750.00
Additional Filing Fees:	
Total Number of Claims in Excess of 20, times \$22:	220.00
Number of Independent Claims in Excess of 3, times \$78:	
One or More Multiple Dependent Claims: Total \$250:	
Total Filing Fees or	
Total Filing Fee Reduced 50% for Small Entity:	
Assignment Recording Fee: \$40	
TOTAL Filing Fee and Assignment Recording Fee:	<u>\$ 970.00</u>

In the event the actual fee is greater than the payment submitted or is inadvertently not enclosed, or if any additional fee during the prosecution of this case is not paid, the Patent and Trademark Office is authorized to charge the underpayment to Deposit Account No. 15-0700.

EXPRESS MAIL CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail Post Office to Addressee (mail label #TB832125415US) in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on November 2, 1995:

Dorothy Jenkins

Name of Person Mailing Correspondence

Signature
November 2, 1995

Date of Signature

Respectfully submitted,

Martin Pfeffer
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P/14-363

INVENTORS DESIGNATION SHEET

TITLE: TWIN WIRE FORMER

PRIORITY CLAIMED UNDER 35 U.S.C. §119: Convention Date August
22, 1989 for German Appln. S.N. P 39 27 597.3

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UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
 Address: COMMISSIONER OF PATENTS AND TRADEMARKS
 Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
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03/253,755 11/02/95 BUCK

R P/14-059

0242/0212

CONTROLLER, HARRY GERS AND SOFFEN
 1120 AVENUE OF THE AMERICAS
 NEW YORK NY 10036-9403

0000

DATE MAILED:

02/12/96

NOTICE TO FILE MISSING PARTS OF APPLICATION FILING DATE GRANTED

An Application Number and Filing Date have been assigned to this application. However, the items indicated below are missing. The required items and fees identified below must be timely submitted **ALONG WITH THE PAYMENT OF A SURCHARGE** for items 1 and 3-6 only of \$ 130 for large entities or \$ 65 for small entities who have filed a verified statement claiming such status. The surcharge is set forth in 37 CFR 1.16(e).

If all required items on this form are filed within the period set below, the total amount owed by applicant as a ☒ large entity, ☐ small entity (verified statement filed), is \$ 130.

Applicant is given **ONE MONTH FROM THE DATE OF THIS LETTER, OR TWO MONTHS FROM THE FILING DATE** of this application, **WHICHEVER IS LATER**, within which to file all required items and pay any fees required above to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

1. ☐ The statutory basic filing fee is: ☐ missing ☐ insufficient. Applicant as a ☐ large entity ☐ small entity, must submit \$ _____ to complete the basic filing fee.
 2. ☐ Additional claim fees of \$ _____ as a ☐ large entity, ☐ small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
 3. ☒ The oath or declaration:
 - ☒ is missing.
 - ☐ does not cover the newly submitted items.
- An oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date is required.
4. ☐ The oath or declaration does not identify the application to which it applies. An oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.
 5. ☐ The signature(s) to the oath or declaration is/are: ☐ missing; ☐ by a person other than the inventor or a person qualified under 37 CFR 1.42, 1.43, or 1.47. A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.
 6. ☐ The signature of the following joint inventor(s) is missing from the oath or declaration:

_____ An oath or declaration listing the names of all inventors and signed by the omitted inventor(s), identifying this application by the above Application Number and Filing Date, is required.
 7. ☐ The application was filed in a language other than English. Applicant must file a verified English translation of the application and a fee of \$ _____ under 37 CFR 1.17(k), unless this fee has already been paid.
 8. ☐ A \$ _____ processing fee is required since your check was returned without payment. (37 CFR 1.21(m)).
 9. ☐ Your filing receipt was mailed in error because your check was returned without payment.
 10. ☐ The application does not comply with the Sequence Rules. See attached Notice to Comply with Sequence Rules 37 CFR 1.821-1.825.
 11. ☐ Other.

Direct the response to Box Missing Part and refer any questions to the Customer Service Center at (703) 308-1202.

A copy of this notice MUST be returned with the response.

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P/14-363



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	New York, New York
Rudolf BUCK et al.	Date: February 7, 1996
Serial No.: 08/556,769	Group Art Unit:
Filed: November 2, 1995	Examiner:
For: TWIN WIRE FORMER	

Hon. Commissioner of Patents and Trademarks Washington, D.C. 20231	

PRELIMINARY AMENDMENT

Sir:

Please amend the above-identified application prior to examination, as follows:

IN THE CLAIMS:

Please amend the claims as follows:

Claim 1, line 29, change "that strip contacts" to
--that the strips contact--.

Claim 15, line 3, change "curved" to --first--;
line 6, change "section" to --suction--; and
line 7, change "curved" to --first--.

Claim 21, line 3, change "first" to --second--.

Claim 25, line 1, change "14" to --24--.

Claim 27, line 2, change "stationary" to --second--.

Claim 28, line 2, change "stationary" to --second--.

Claim 29, line 29, change "that strip" to --that the strips--;

line 30, change "contacts" to --contact--;

line 36, after "zone; a" insert --second--;

and

line 38, change "the drainage" to --the second drainage-- both occurrences.

Claim 30, line 29, change "the strip" to --that the strips--;

line 30, change "contacts" to --contact--;

line 36, after "zone; a" insert --second--;

and

line 38, change "stationary" to --second--.

Please add the following new claim(s):

--31. The ~~former~~ wire former of claim 1, wherein the first drainage element is a forming roller.--

REMARKS

Claims 1, 15, 21, 25, 27, 28, 29 and 30 have been amended to correct typographical and other similar minor errors. Claim 31 has been added to more adequately protect applicants' invention.

Examination and early allowance of the application are respectfully requested.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on February 7, 1996:

Martin Pfeffer

Name of applicant, assignee or Registered Representative

Signature

February 7, 1996

Date of Signature

Respectfully submitted,

Martin Pfeffer

Registration No.: 20,808

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002/003

P/14-363

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	New York, New York
Rudolf BUCK et al.	Date: February 7, 1996
Serial No.: 08/556,769	Group Art Unit:
Filed: November 2, 1995	Examiner:
For: TWIN WIRE FORMER	

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Please amend the above-identified application prior to examination, as follows:

IN THE CLAIMS:

Please amend the claims as follows:

Claim 1, line 29, change "that strip contacts" to
--that the strips contact--.

Claim 15, line 3, change "curved" to --first--;
line 6, change "section" to --suction--; and
line 7, change "curved" to --first--.

Claim 21, line 3, change "first" to --second--.

Claim 25, line 1, change "14" to --24--.

Claim 27, line 2, change "stationary" to --second--.

Claim 28, line 2, change "stationary" to --second--.

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OSTROLENK FABER

0003/003

Claim 29, line 29, change "that strip" to --that the strips--;

line 30, change "contacts" to --contact--;

line 36, after "zone; a" insert --second--;

and

line 38, change "the drainage" to --the second drainage-- both occurrences.

Claim 30, line 29, change "the strip" to --that the strips--;

line 30, change "contacts" to --contact--;

line 36, after "zone; a" insert --second--;

and

line 38, change "stationary" to --second--.

Please add the following new claim(s):

--31. The twin wire former of claim 1, wherein the first drainage element is a forming roller.--

REMARKS

Claims 1, 15, 21, 25, 27, 28, 29 and 30 have been amended to correct typographical and other similar minor errors. Claim 31 has been added to more adequately protect applicants' invention.

Examination and early allowance of the application are respectfully requested.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on February 7, 1996:

Martin Pfeffer

Name of applicant, assignee or
Registered Representative

Signature

February 7, 1996

Date of Signature

Respectfully submitted,

Martin Pfeffer

Registration No.: 20,808

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AMDT136257

-2-

OFFICIAL

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OSTROLENK FABER

001/003

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FACSIMILE TRANSMITTAL SHEET

TO: Examiner K. Hastings - Group A Unit
 FIRM: U.S.P.T.O.
 FACSIMILE NUMBER: 703 308 0470
 FROM: Mr. Martin Pfeffer
 TOTAL NUMBER OF PAGES: 3 INCLUDING COVER SHEET.
 RE: OFGS FILE NO.: P/14-363 U.S. Pat. App. No. 08/556,769
 OPERATOR:
 DATE: September 19, 1996 TIME: _____

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REMARKS:

MBCN169664

P/14-363

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Rudolf BUCK et al.

Date: February 7, 1996

Serial No.: 08/556,769

Group Art Unit:

Filed: November 2, 1995

Examiner:

For: TWIN WIRE FORMER

AMENDMENT TRANSMITTAL LETTER - FEE COMPUTATIONHon. Commissioner of Patents and Trademarks
Washington, D.C. 20231

Transmitted herewith is an amendment in the above-identified application.

"Small Entity" status (37 C.F.R. §1.9 & §1.27) established previously by enclosed verified statement.

OFGS Check No. 55278, which includes the fee of \$22.00 calculated below, is attached.

NO. CLAIMS AFTER AMENDMENT	HIGHEST NO. PREVIOUSLY PAID FOR	EXTRA PRESENT	RATE	ADDIT. FEE
TOTAL 31	MINUS 20	* =	X (\$11 SE or \$22)	\$22.00
INDEP. 3	MINUS 3	** =	X (\$39 SE or \$78)	\$
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				X (\$120 SE or \$240)
* not less than 20 ** not less than 3				TOTAL \$22.00

In the event the actual fee is greater than the payment submitted or is inadvertently not enclosed or if any additional fee during the prosecution of this application is not paid, the Patent Office is authorized to charge the underpayment to Deposit Account No. 15-0700.

If this communication is filed after the shortened statutory time period had elapsed and no separate Petition is enclosed, the Commissioner of Patents and Trademarks is petitioned, under 37 C.F.R. §1.136(a), to extend the time for filing a response to the outstanding Office Action by the number of months which will avoid abandonment under 37 C.F.R. §1.135. The fee under 37 C.F.R. § 1.17 should be charged to our Deposit Account No. 15-0700.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on February 7, 1996:

Martin Pfeffer

Name of Registered Representative

Signature

February 7, 1996

Date of Signature

Respectfully submitted,

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P/14-363

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

New York, New York

Rudolf Buck, et al.

Date: February 7, 1996

Serial No.: 08/556,769

Group Art Unit:

Filed: November 2, 1995

Examiner:

For: TWIN WIRE FORMER

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

INFORMATION DISCLOSURE STATEMENT

Sir:

Pursuant to 37 C.F.R. §§1.97 and 1.98, applicants are submitting the documents listed in the attached PTO Form 1449 for consideration by the Examiner. These documents were all previously cited by or submitted to the Office in applicant's related applications Serial Nos. 08/055,918 and 08/286,948.

Also, enclosed is an Information Disclosure Statement dated May 23, 1994, which was filed in the related applications and which describes the relevance of certain of the documents including the non-English language documents, and also discusses an alleged prior use/sale brought to applicant's attention by an opposer in an opposition proceeding in the European Patent Office.

In accordance with 37 C.F.R. §1.98(d), copies of the documents are not being provided.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on February 7, 1996:

Respectfully submitted,

Martin Pfeffer, Esq.

Name of Applicant, assignee or
Registered Representative

Signature

February 7, 1996

Date of Signature

Martin Pfeffer

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Enclosures

AMDTN145756

FA-1875 CONT (14-285)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	New York, New York
Rudolf Buck et al.	Date: May 23, 1994
Serial No.: 08/055,918	Group Art Unit: 1303
Filed: April 29, 1993	Examiner: Karen Hastings
For: TWIN WIRE FORMER	

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

INFORMATION DISCLOSURE STATEMENT

Sir:

Pursuant to 37 C.F.R. §§1.97 and 1.98, applicants are submitting the following patent documents for consideration by the Examiner:

Patent Documents

1. European A 0 296 135
2. US A 4 532 008
3. German A 3 321 406
4. European A 0 306 759
5. US A 4 769 111
6. German A 3 628 282
7. German A 3 329 833
8. WO 86/04368
9. European A 0 289 445

These documents were cited in an opposition proceeding in the European Patent Office regarding a counterpart of the above-identified application.

The relevance of the documents as alleged by the opposer is as follows:

AMDT79677

1. Patent document 1 has been cited to show a twin wire former in which in the first section of the twin wire zone the wires 10 and 20 travel over a rotating forming cylinder 21. Dewatering strips or battens 111 and 112 rest against the wire 20 in the upper wire loop and battens 101, 102 and 103 rest against the belt in the lower wire loop. Although the battens can be adjusted perpendicular to the plane of the wire, the battens are rigidly and not flexibly supported. In the third section of the twin zone the wire belts travel over stationary dewatering components constituted by a forming shoe 14 and a flatbox 16.

Among the differences recognized by the opposer are a) that the suspension in the twin wire former which is the subject of the above-identified application is fed directly into the intake gap whereas in patent document 1, a single wire preliminary dewatering part is provided upstream of this gap (i.e., the former in patent document 1 is a hybrid former), and b) the dewatering battens in one of the two wire belts of the invention of the present application are flexibly supported whereas no such flexible support is present in the former disclosed in patent document 1.

2. Patent document 2 was cited for the same reasons advanced above in connection with patent document 1 and has the same deficiencies. In particular, in patent document 2 in the first section of the twin wire zone two wires travel over a dewatering element ("foil box") 22' with a curved top. In this section, the wire belts create a wedge-shaped intake gap. In the second section of the twin wire zone, several dewatering battens 52 with positions that can be adjusted rest against a wire belt in the upper wire loop and several dewatering battens 50 rest against the wire belt in the lower wire loop. The upper and lower dewatering battens are mutually displaced along the wire. In the third section of the twin wire zone, the belts travel over a dewatering component formed of a flat box ("suction box") 85.

Again, as in the case of patent document 1, patent document 2 discloses a hybrid twin wire former in which there is a single wire preliminary dewatering section upstream of the twin

wire zone and also discloses rigidly supported battens or dewatering strips.

3. Patent document 3 was cited to show a twin wire former in which the stock is introduced into an intake gap.

4. Patent documents 4, 5 and 6 have been cited to show flexibly supported battens in a twin wire former. The battens, however, are not displaced as set forth in applicants' invention. Additionally, the twin wire formers of documents 4, 5 and 6 are hybrid twin wire formers having respective single wire dewatering sections upstream of the twin wire zone.

5. Patent documents 7, 8 and 9 were cited as showing the state of the art. However, it is noted that the characteristic of direct introduction of suspension to the wedge-shaped intake gap from the head box is missing, as is any disclosure regarding use of battens and of course, any disclosure regarding the positioning or flexibility of the battens.

Additional Information

In addition to the patent documents noted above, opposer also cited the machine shown in Attachments A and B which opposer alleges was manufactured by opposer, Valmet Paper Machinery, Inc. of Helsinki, Finland and shipped to the James River Corporation of Clatskanie, Oregon. According to opposer, the twin wire former illustrated in Attachments A and B was operated for the first time on February 1, 1989. The various components of the twin wire former in Attachment B and C are assigned the same reference numerals used to specify the allegedly similar components of the embodiments set forth in applicants' application. Attachment B illustrates in larger scale the detail designated X of Attachment A.

The characteristics of the twin-wire former illustrated in Attachments A and B according to opposer are as follows:

"Two wire belts 11 and 12 together constitute a twin-wire part.

In the first section of the twin-wire part is a curved dewatering component in the form of a rotating cylinder 40, which

wire belts 11 and 12 travel over. Between the two wire belts 11 and 12 in this first section is a wedge-shaped stock-intake gap 15. Upstream of stock-intake gap 15 is a headbox 10, which introduces the suspension directly into gap 15.

In another section downstream of the first section, two dewatering battens 27 rest against wire belt 11. Many dewatering battens 28 also rest against wire belt 12 in the second section of the twin-wire part. The more upstream batten 27 rests against the wire belt 11 between facing battens 28. The more downstream batten 27 rests against belt 11 downstream of the most downstream batten 28. Battens 27 and 28 are accordingly mutually displaced along the wire.

In a third section of the twin-wire part, wire belts 11 and 12 travel over three stationary dewatering components in the form of flatboxes 31.

The structure of and means of support for battens 27 is illustrated in detail in Attachment B. Batten 27 is secured to a support that pivots on a component secured to the overall device. Between that component and the support is a pneumatically pressurized hose. The forces transmitted to the support by the hose, downward in Attachment B, shift batten 27 into the position represented by the dot-and-dash lines. From this position the batten can be raised into the position represented by the continuous lines in opposition to the force exerted by the hose. Batten 27 is accordingly flexibly supported. This is true of both the battens 27 illustrated in Attachment A."

In connection with the former illustrated in Attachments A and B, applicants would like to point out that of the two upper battens 27, the first batten 27 lies opposite the lower batten 28 in the lower wire loop and at least partly overlaps. Accordingly, the battens 27 and 28 are not offset and not in opposing relationship. The second batten 27 is located so far away from the bank of battens 28 that there is no cooperation between the second batten 27 and the bank of battens 28. Indeed, the second batten 27 is so far removed from the lower battens 28

that in effect one could consider it to be located outside of the second section as defined in applicants' claims.

In addition, it is proposed to amend applicants' claims to specify that the last one of the second drainage strips (the fixed strips 28) are located downstream of the last one of the first drainage strips (i.e. the flexibly supported strips 27). In contrast, assuming arguendo that the second batten 27 or alleged flexible strip of the former of Attachments A and B is considered to be part of the second section, it is located downstream of the last one of the fixed battens 28 and, therefore, does not meet this added limitation of applicants' claims but, instead, teaches away therefrom.

Turning now to the question of whether the twin wire former of Attachments B and C is prior art, applicants note that other than opposer's allegation, no proof has been offered nor is presently available to applicants regarding whether the twin wire former shown in Attachments A and B is the same as the twin wire former which it is alleged was put into use by James River Corporation on February 1, 1989, nor are there any facts available to applicants from which applicants can determine that such use was either a public use or that such wire former had been sold or was on sale. In any event, applicants believe that they patentably distinguishes over the twin former in Attachments A and B as discussed above. In addition, there is no teaching in the wire former of Attachments A and B of the thickness or spacing of the draining strips as set forth in applicants' claim 16.

Certification

I certify that each item of information contained in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this statement.

Petition

Applicants hereby petition pursuant to 37 C.F.R. \$1.97(d)(1)(ii) that this Information Disclosure Statement be considered. A check in the amount of \$130 is enclosed for the petition fee required by 37 C.F.R. \$1.97(d)(1)(iii) and \$1.17(i)(1). If any additional fees are due, you are authorized to charge the same to the undersigned's deposit Account No. 15-0700.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on May 23, 1994;

Respectfully submitted,

Martin Pfeffer

Name of applicant, assignee or
Registered Representative

Signature

May 23, 1994

Date of Signature

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
MP/lrc/ss

EXHIBIT

3

PART 2

Sheet 1 of 1

APPLICANT'S ART CITATION (Use several sheets if necessary)		Application <u>08/556,769</u>		OPGS File No. <u>P/14-363</u>									
		Applicant <u>Rudolf BUCK et al.</u>											
		Filing Date <u>November 2, 1995</u>		Group Art Unit <u>1303</u>									
U.S. PATENT DOCUMENTS													
Examiner Initial	Document Number							Date	Name	Class	Sub-class	Filing Date If Appropriate	
KMT	5	3	8	9	2	0	6	02/14/95	Buck et al.	162	301		
KMT	5	3	8	9	2	0	6	11/30/96	Holme et al.	162	301		
	4	4	2	5	1	8	7	01/10/84	Armstrong et al.	162	300		
	4	5	3	2	0	0	8	07/30/85	Creagan et al.	162	203		
	4	6	0	9	4	3	5	09/02/86	Tissari	162	352		
	4	7	6	9	1	1	1	09/06/88	Nevalainen et al.	162	351		
	4	9	1	7	7	6	6	04/17/90	Koivuranta et al.	162	301		
	4	9	2	5	5	3	1	05/15/90	Koski	162	301		
	5	0	7	8	8	3	5	01/07/92	Schiel et al.	162	352		
FOREIGN PATENT DOCUMENTS													
	Document Number							Date	Country	Class	Sub-class	Translation	
	Yes	No											
KMT	0	2	8	9	4	4	5	04/28/88	EPO				
	0	2	9	6	1	3	5	06/06/88	EPO				
	0	3	0	6	7	5	9	08/22/88	EPO				
	3	3	2	1	4	0	6	06/14/83	Germany				
	3	1	3	8	1	3	3	09/25/81	Germany				
	3	3	2	9	8	3	3	08/18/83	Germany				
	8	8	0	6	0	3	6	05/06/88	Germany				
	3	6	2	8	2	8	2	08/20/86	Germany				
	1	1	2	5	9	0	6	10/29/65	Great Britain				
	8	6	0	4	3	6	8	07/31/86	PCT				
OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)													
		TAPPI PRESS, "1989 Twin-Wire Seminar", Washington Hilton, Washington, D.C., April 12-14, 1989, pp. iii, 103-114											
Examiner <u>KMT</u>		Date Considered <u>9-96</u>											
EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.													

MISCN145710

* was incorrect, examiner corrected
number + name

#4

UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR CONTINUING APPLICATION			OFGS FILE NO. P/14-363																																												
<p>As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name; that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: _____</p> <p style="text-align: center;">TWIN WIRE FORMER</p> <p>the specification of which</p> <p><input type="checkbox"/> is attached hereto.</p> <p>XX was filed on <u>11/02/95</u> as United States Patent Application Serial No. <u>08/556,769</u></p> <p><input type="checkbox"/> was filed on _____ as PCT International application No. _____</p> <p>and was amended on <u>02/07/96</u> (if any).</p> <p>I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by the amendment referred to above.</p> <p>I acknowledge my duty to disclose all information known to be material to patentability, pursuant to Title 37, Code of the Federal Regulations, §1.56.</p> <p>I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of this application on which priority is claimed:</p> <p>Prior Foreign Application(s)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">COUNTRY</th> <th style="width: 30%;">APPLICATION NUMBER</th> <th style="width: 20%;">DATE OF FILING (day, month, year)</th> <th style="width: 25%;">PRIORITY CLAIMED UNDER 35 U.S.C. 119</th> </tr> </thead> <tbody> <tr> <td>Germany</td> <td>P 39 27 597.3</td> <td>08/22/89</td> <td>XX Yes <input type="checkbox"/> No</td> </tr> <tr> <td></td> <td></td> <td></td> <td><input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> <tr> <td></td> <td></td> <td></td> <td><input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> </tbody> </table> <p>I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">(Application Serial No.)</th> <th style="width: 30%;">(Filing Date)</th> <th style="width: 40%;">(Status)</th> </tr> </thead> <tbody> <tr> <td>07/773,965</td> <td>November 12, 1991</td> <td>Abandoned</td> </tr> <tr> <td>08/286,948</td> <td>August 8, 1994</td> <td>Pending</td> </tr> <tr> <td>08/055,918</td> <td>April 29, 1993</td> <td>Issued</td> </tr> </tbody> </table> <p>As to the application under which I claim benefit under Title 35, United States Code, §120, I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:</p> <p>Prior Foreign Application(s)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">COUNTRY</th> <th style="width: 30%;">APPLICATION NUMBER</th> <th style="width: 20%;">DATE OF FILING (day, month, year)</th> <th style="width: 25%;">PRIORITY CLAIMED UNDER 35 U.S.C. 119</th> </tr> </thead> <tbody> <tr> <td>Germany</td> <td>P 39 27 597.3</td> <td>08/22/89</td> <td>XX Yes <input type="checkbox"/> No</td> </tr> <tr> <td></td> <td></td> <td></td> <td><input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> <tr> <td></td> <td></td> <td></td> <td><input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> </tbody> </table>				COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119	Germany	P 39 27 597.3	08/22/89	XX Yes <input type="checkbox"/> No				<input type="checkbox"/> Yes <input type="checkbox"/> No				<input type="checkbox"/> Yes <input type="checkbox"/> No	(Application Serial No.)	(Filing Date)	(Status)	07/773,965	November 12, 1991	Abandoned	08/286,948	August 8, 1994	Pending	08/055,918	April 29, 1993	Issued	COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119	Germany	P 39 27 597.3	08/22/89	XX Yes <input type="checkbox"/> No				<input type="checkbox"/> Yes <input type="checkbox"/> No				<input type="checkbox"/> Yes <input type="checkbox"/> No
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~~XX~~ CONTINUED ON PAGE 2

OFGS FORM DE1 (392)

PAGE 2

UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR CONTINUING APPLICATION		OFCS FILE NO. P/14-363
<p>I hereby appoint OSTROLENK, FABER, GERB & SOFFEN and the members of the Firm. Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Berliner—Reg. No. 18,653; Robert C. Faber—Reg. No. 24,322; Edward A. Meilman—Reg. No. 24,735; Stanley H. Lieberstein—Reg. No. 22,490; Steven I. Weisburd—Reg. No. 27,409; Max Moskowitz—Reg. No. 30,576; Stephen A. Soffen—Reg. No. 31,963; and James A. Finder—Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.</p> <p>SEND CORRESPONDENCE TO:</p> <p>OSTROLENK, FABER, GERB & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NEW YORK 10036-8403 DIRECT TELEPHONE CALLS TO: (212) 382-0700</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>		
100	Full name of Sole or First Inventor Dieter Egelhof	Inventor's Signature <i>Dieter Egelhof</i>
	Residence D-7920 Heidenheim	Country of Citizenship Germany
	Post Office Address Lucas-Cranach-Str. 15, D-7920 Heidenheim, Germany	
200	Full name of Second Joint Inventor Klaus Benschler	Inventor's Signature <i>Klaus Benschler</i>
	Residence D-7920 Heidenheim	Country of Citizenship Germany
	Post Office Address Wildstr. 20, D-7920 Heidenheim, Germany	
	Full name of Third Joint Inventor Werner Kade	Inventor's Signature <i>Werner Kade</i>
	Residence Neenah, Wisconsin 54956	Country of Citizenship Germany
	Post Office Address 521 Harbor Light Court, Neenah, Wisconsin 54956, USA	
400	Full name of Fourth Joint Inventor Albrecht Meinecke	Inventor's Signature <i>Albrecht Meinecke</i>
	Residence D-7920 Heidenheim	Country of Citizenship Germany
	Post Office Address Hans-Holbein-Str. 39, D-7920 Heidenheim, Germany	
500	Full name of Fifth Joint Inventor Wilhelm Wanke	Inventor's Signature <i>Wilhelm Wanke</i>
	Residence D-7920 Heidenheim	Country of Citizenship Germany
	Post Office Address Dopanschwabenstr. 47, D-7920 Heidenheim, Germany	

OFCS FORM DE2 (790)

CONTINUED ON PAGE 3

05/20/88 13:43 FAX 212 392 0888

OSTROLENK FABER
PAGE 2

0006/007

UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR CONTINUING APPLICATION		CASE FILE NO. P/14-363
<p>I hereby appoint OSTROLENK, FABER, GERB & SOFFEN and the members of the Firm, Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Berliner—Reg. No. 18,653; Robert C. Faber—Reg. No. 24,322; Edward A. Mellman—Reg. No. 24,735; Stanley H. Lieberstein—Reg. No. 22,400; Steven I. Welsch—Reg. No. 27,409; Max Moskowitz—Reg. No. 30,576; Stephen A. Soffen—Reg. No. 31,063; and James A. Finder—Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.</p> <p>SEND CORRESPONDENCE TO: OSTROLENK, FABER, GERB & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NEW YORK 10036-9403 DIRECT TELEPHONE CALLS TO: (212) 382-0700</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>		
Full name of First Inventor Dieter Egolhof	Inventor's Signature	Date
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Lucas-Cranach-Str. 15, D-7920 Heidenheim, Germany		
Full name of Second Joint Inventor Elaus Henseler	Inventor's Signature	Date
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Wildstr. 20, D-7920 Heidenheim, Germany		
Full name of Third Joint Inventor Warner Kade	Inventor's Signature	Date 5/20/96
Residence Neenah, Wisconsin 54956	Country of Citizenship Germany	
Post Office Address 521 Harbor Light Court, Neenah, Wisconsin 54956, USA		
Full name of Fourth Joint Inventor Albrecht Meinecke	Inventor's Signature	Date
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Hans-Holbein-Str. 39, D-7920 Heidenheim, Germany		
Full name of Fifth Joint Inventor Wilhelm Wanke	Inventor's Signature	Date
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Donauschwabenstr. 47, D-7920 Heidenheim, Germany		

OPCS FORM DE2 (79)

CONTINUED ON PAGE 3

Page 3

UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR CONTINUING APPLICATION		OFGS FILE NO. P/14-363
<p>I hereby appoint OSTROLENK, FABER, GERB & SOFFEN and the members of the Firm. Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Berliner—Reg. No. 18,653; Robert C. Faber—Reg. No. 24,322; Edward A. Meilman—Reg. No. 24,735; Stanley H. Lieberstein—Reg. No. 22,400; Steven I. Wetsburd—Reg. No. 27,409; Max Moskowitz—Reg. No. 30,576; Stephen A. Soffen—Reg. No. 31,063; and James A. Finder—Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.</p> <p>SEND CORRESPONDENCE TO:</p> <p style="margin-left: 40px;">OSTROLENK, FABER, GERB & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NEW YORK 10036-8403 DIRECT TELEPHONE CALLS TO: (212) 382-0700</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>		
6-00	Full name of 6th Inventor Hans-Jürgen Wulz	Inventor's Signature <i>H. J. Wulz</i>
	Residence D-7920 Heidenheim	Date 20. May 96
	Post Office Address Inselstr. 11, D-7920 Heidenheim, Germany	Country of Citizenship Germany
7-01	Full name of 7th Inventor Rudolf Bück *	Inventor's Signature <i>R. Bück</i>
	Residence D-7920 Heidenheim	Date 20. May 96
	Post Office Address Schlosshastr. 53, D-7920 Heidenheim, Germany	Country of Citizenship Germany
BY HIS LEGAL REPRESENTATIVE <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;">8-11</div> <div> <i>Euse Bück 20. May 96</i> Mrs. Euse Bück </div> </div>		

* By his legal representative

Attorney's Docket No. P/14-363

**ADDED PAGE TO COMBINED DECLARATION AND POWER OF
ATTORNEY FOR SIGNING BY ADMINISTRATOR(TRIX), EXECUTOR(TRIX)
OR LEGAL REPRESENTATIVE ON BEHALF OF DECEASED OR
INCAPACITATED INVENTOR (37 CFR 1.42 AND 1.43)**

I, Mrs. Else Bück
(type or print name(s) of administrator(trix), executor(trix), legal representative or all heirs)
hereby declare that I am a citizen of Germany
residing at Schlosshastr. 53, D-7920 Heidenheim, Germany

and that I am executing and signing the declaration to which this is attached as

(check one):

- ☐ the administrator(trix) of
☐ executor(trix) of the last will and testament of
☒ legal representative (or heirs) of
Rudolf Bück

Full name of (first, second etc.) deceased or incapacitated inventor
Germany

Country of citizenship of deceased or incapacitated inventor
D-7920 Heidenheim

Residence of deceased or incapacitated inventor
Schlosshastr. 53, D-7920 Heidenheim, Germany

Post Office Address of deceased or incapacitated inventor

That, upon information and belief, I aver those facts that the inventor is required to state.
Date: 20. Mai 1996 Else Bück

Mrs. Else Bück



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Rudolf Buck et al.

Serial No.: 08/556,769

Date: June 11, 1996

Group Art Unit:

Examiner:

Filed: November 2, 1995

For: TWIN WIRE FORMER

Hon. Commissioner of Patents and Trademarks
Washington, DC 20231

Attention: Application Branch

RESPONSE TO NOTICE TO FILE MISSING
PARTS OF APPLICATION - FILING DATE GRANTED

Sir:

In response to the Notice to File Missing Parts of Application - Filing Date Granted, mailed February 12, 1996, submitted herewith is the Inventors Declaration and our Check No. 58303 which includes the amount of \$130.00 (\$65.00 for Small Entity) in payment of the surcharge.

In the event the actual fee is greater than the payment submitted or is inadvertently not enclosed or if any additional fee during the prosecution of this application is not paid, the Patent Office is authorized to charge the underpayment to Deposit Account #15-0700.

If this communication is filed after the time period had elapsed and no separate Petition is enclosed, the Commissioner of Patents and Trademarks is petitioned, under 37 C.F.R. §1.136(a), to extend the time for filing a response by the number of months which will avoid abandonment under 37 C.F.R. §1.135. The fee under 37 C.F.R. § 1.17 should be charged to our Deposit Account No. 15-0700.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on June 11, 1996:

Martin Pfeffer

Name of applicant, assignee or
Registered Representative

Signature
June 11, 1996

Date of Signature

MP:arr

Respectfully submitted,

Martin Pfeffer
Registration No.: 20,808
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 Avenue of the Americas
New York, New York 10036-8403
Telephone: (212) 382-0700

MISC161065



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Rudolf Buck et al.

Serial No.: 08/556,769

Filed: November 2, 1995

For: TWIN WIRE FORMER

Date: June 11, 1996

Group Art Unit:

Examiner:

Hon. Commissioner of Patents and Trademarks
Washington, D.C. 20231

PETITION AND FEE FOR AUTOMATIC EXTENSION OF TIME
UNDER 37 CFR 1.17, 1.136(a) AND 35 USC 41(a)8

Sir:

Applicants hereby petitions the Commissioner of Patents and Trademarks to extend the time for filing a response to the outstanding Office Action by three (3) months. Enclosed is our check No. _____ which includes the amount of \$900.00 for the petition fee in accordance with 37 CFR 1.17 computed as:

XX Response within third month

XX not small entity (\$900) _____ small entity (\$450)

You are authorized to charge to our Deposit Account No. 15-0700 any additional amounts owing.

If this petition is inadequate to avoid abandonment, the Commissioner of Patents and Trademarks is petitioned, under 37 C.F.R. §1.136(a), to extend the time by the number of months which will avoid abandonment under 37 C.F.R. §1.135. The fee under 37 C.F.R. § 1.17 should be charged to our Deposit Account No. 15-0700.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on June 11, 1996:

Martin Pfeffer

Name of applicant, assignee or
Registered Representative

Signature

June 11, 1996

Date of Signature

Respectfully submitted,

Martin Pfeffer

Registration No.: 20,808
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 Avenue of the Americas
New York, New York 10036-8403
Telephone: (212) 382-0700

MP:arr



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
08/586,769	11/02/95	HUCK	R P/14-363

0242/0212

OSTROLENK FABER GERB AND SOFFEN
1180 AVENUE OF THE AMERICAS
NEW YORK NY 10036-8403

0000

DATE MAILED:

02/12/96

NOTICE TO FILE MISSING PARTS OF APPLICATION FILING DATE GRANTED

An Application Number and Filing Date have been assigned to this application. However, the items indicated below are missing. The required items and fees identified below must be timely submitted **ALONG WITH THE PAYMENT OF A SURCHARGE** for items 1 and 3-6 only of \$ 130 for large entities or \$ 65 for small entities who have filed a verified statement claiming such status. The surcharge is set forth in 37 CFR 1.16(e).

If all required items on this form are filed within the period set below, the total amount owed by applicant as a ☒ large entity, ☐ small entity (verified statement filed), is \$ 130.

Applicant is given **ONE MONTH FROM THE DATE OF THIS LETTER, OR TWO MONTHS FROM THE FILING DATE** of this application, **WHICHEVER IS LATER**, within which to file all required items and pay any fees required above to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

1. ☐ The statutory basic filing fee is: ☐ missing ☐ insufficient. Applicant as a ☐ large entity ☐ small entity, must submit \$ _____ to complete the basic filing fee.
 2. ☐ Additional claim fees of \$ _____ as a ☐ large entity, ☐ small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
 3. ☒ The oath or declaration:
 - ☒ is missing.
 - ☐ does not cover the newly submitted items.
- An oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date is required.
4. ☐ The oath or declaration does not identify the application to which it applies. An oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.
 5. ☐ The signature(s) to the oath or declaration is/are: ☐ missing; ☐ by a person other than the inventor or a person qualified under 37 CFR 1.42, 1.43, or 1.47. A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.
 6. ☐ The signature of the following joint inventor(s) is missing from the oath or declaration:

_____ An oath or declaration listing the names of all inventors and signed by the omitted inventor(s), identifying this application by the above Application Number and Filing Date, is required.
 7. ☐ This application was filed in a language other than English. Applicant must file a verified English translation of the application and a fee of \$ _____ under 37 CFR 1.17(k), unless this fee has already been paid.
 8. ☐ A \$ _____ processing fee is required since your check was returned without payment. (37 CFR 1.21(m)).
 9. ☐ Your filing receipt was mailed in error because your check was returned without payment.
 10. ☐ The application does not comply with the Sequence Rules. See attached Notice to Comply with Sequence Rules 37 CFR 1.821-1.825.
 11. ☐ Other.

Direct the response to Box Missing Part and refer any questions to the Customer Service Center at (703) 308-1202.

A copy of this notice *MUST* be returned with the response.

05/20/06 13:43 FAX 212 382 0888

OSTROLENK FABER

005/007

UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR CONTINUING APPLICATION			OPGS FILE NO. P/14-363																
<p>As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name: that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: _____</p> <p style="text-align: center;">TWIN WIRE FORMER</p>																			
<p>the specification of which</p> <p><input type="checkbox"/> is attached hereto.</p> <p><input checked="" type="checkbox"/> was filed on <u>11/02/95</u> as United States Patent Application Serial No. <u>08/556,769</u></p> <p><input type="checkbox"/> was filed on _____ as PCT international application No. _____</p> <p>and was amended on <u>02/07/96</u> (if any).</p> <p>I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by the amendment referred to above.</p> <p>I acknowledge my duty to disclose all information known to be material to patentability, pursuant to Title 37, Code of the Federal Regulations, §1.56.</p> <p>I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:</p>																			
<p>Prior Foreign Application(s)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">COUNTRY</th> <th style="width: 25%;">APPLICATION NUMBER</th> <th style="width: 25%;">DATE OF FILING (day, month, year)</th> <th style="width: 25%;">PRIORITY CLAIMED UNDER 35 U.S.C. 119</th> </tr> </thead> <tbody> <tr> <td>Germany</td> <td>P 39 27 597.3</td> <td>08/22/89</td> <td><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> <tr> <td></td> <td></td> <td></td> <td><input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> <tr> <td></td> <td></td> <td></td> <td><input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> </tbody> </table>				COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119	Germany	P 39 27 597.3	08/22/89	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				<input type="checkbox"/> Yes <input type="checkbox"/> No				<input type="checkbox"/> Yes <input type="checkbox"/> No
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119																
Germany	P 39 27 597.3	08/22/89	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No																
			<input type="checkbox"/> Yes <input type="checkbox"/> No																
			<input type="checkbox"/> Yes <input type="checkbox"/> No																
<p>I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(s) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">(Application Serial No.)</th> <th style="width: 30%;">(Filing Date)</th> <th style="width: 40%;">(Status)</th> </tr> </thead> <tbody> <tr> <td>07/773,965</td> <td>November 12, 1991</td> <td>Abandoned</td> </tr> <tr> <td>08/286,948</td> <td>August 8, 1994</td> <td>Pending</td> </tr> <tr> <td>08/055,918</td> <td>April 29, 1993</td> <td>Issued</td> </tr> </tbody> </table> <p>As to the application under which I claim benefit under Title 35, United States Code, §120, I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:</p>				(Application Serial No.)	(Filing Date)	(Status)	07/773,965	November 12, 1991	Abandoned	08/286,948	August 8, 1994	Pending	08/055,918	April 29, 1993	Issued				
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Germany	P 39 27 597.3	08/22/89	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No																
			<input type="checkbox"/> Yes <input type="checkbox"/> No																
			<input type="checkbox"/> Yes <input type="checkbox"/> No																

CONTINUED ON PAGE 2

OPGS FORM DE1 (292)

05/20/08 13:43 FAX 212 382 0888

OSTROLENK FABER

007/007

UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR CONTINUING APPLICATION		OPGS FILE NO. P/14-363
<p>I hereby appoint OSTROLENK, FABER, GERB & SOFFEN and the members of the Firm: Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Bartiner—Reg. No. 18,653; Robert C. Faber—Reg. No. 24,322; Edward A. Meliman—Reg. No. 24,735; Stanley H. Lieberstein—Reg. No. 22,400; Steven I. Weisburg—Reg. No. 27,409; Max Moskowitz—Reg. No. 30,576; Stephen A. Soffen—Reg. No. 31,063; and James A. Finder—Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.</p> <p>SEND CORRESPONDENCE TO: OSTROLENK, FABER, GERB & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NEW YORK 10036-8403 DIRECT TELEPHONE CALLS TO: (212) 382-0700</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>		
Full name of 6th Inventor Wans-Jurgen wulz	Inventor's Signature	Date
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Inselstr. 11, D-7920 Heidenheim, Germany		
Full name of 7th Inventor Rudolf Buck *	Inventor's Signature	Date
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Schlosshastr. 53, D-7920 Heidenheim, Germany		
BY HIS LEGAL REPRESENTATIVE		
Mrs. Else Buck		

* By his legal representative



OSTROLENK, FABER, GERB & SOFFEN, LLP

Receipt

1180 AVENUE OF THE AMERICAS, NEW YORK, NEW YORK 10036-8403
TEL 212 382 0700 FAX 212 382 0888 FAX 212 398 0681 TELEX 236925
email@ostrolenk.com MCI Mail: 205-3187

#5

MARVIN C. SOFFEN
SAMUEL H. WEINER
JEROME M. BERLJNER
ROBERT C. FABER
EDWARD A. MEILMAN
STANLEY H. LIBERSTEIN
STEVEN I. WEISBURD

MAX MOSKOWITZ
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JOSEPH R. KEATING
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ALISSA M. EAGLE**
LAWRENCE E. RUSS

OF COUNSEL

MARTIN PFEFFER
LEON ZITVER*
HAROLD EINHORN
*DC BAR
**VA BAR

WASHINGTON OFFICE

1725 K STREET, N. W.
WASHINGTON, D.C. 20006
TEL 202 457 7785
FAX 202 429 8919

July 11, 1996

Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Att: Application Processing Division's
Customer Correction Branch

Re: Application No. : 08/556,769
Filing Date : 11/3/95
Title : TWIN WIRE FORMER
Our File : P/14-363

RECEIVED

JUL 25 1996

GROUP 3200

Dear Sir:

Please note an error in the address of applicant WERNER KADE. AS shown on page 2 of the Declaration, copy enclosed, his address is NEENAH, WISCONSIN, USA.

Please make this change and send us a corrected filing receipt.

Very truly yours,

OSTROLENK FABER GERB & SOFFEN, LLP

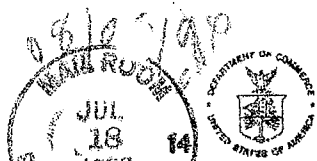
Martin Pfeffer

MP:BF
Enc.

GROUP 130
JUL 25 1996

PTO-101X
(Rev. 1-96)

FILING RECEIPT



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	GRP ART UNIT	FIL FEE REC'D	ATTORNEY DOCKET NO.	DRWGS	TOT CL	IND CL
08/556,769	11/12/95	3201	\$1,122.00	P/14-363	2	30	3

OSTROLENK FABER GERB & SOFFEN
1180 AVENUE OF THE AMERICAS
NEW YORK NY 10036-8403

RECEIVED
JUL 25 1996
GROUP 3200

Receipt is acknowledged of this nonprovisional Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please write to the Application Processing Division's Customer Correction Branch within 10 days of receipt. Please provide a copy of the Filing Receipt with the changes noted thereon.

Applicant(s)

DIETER EGELHOF, HEIDENHEIM, FED REP GERMANY; KLAUS
HENSELER, HEIDENHEIM, FED REP GERMANY; WERNER KADE,
NEENAH, FED REP GERMANY; ALBRECHT MEINECKE, HEIDENHEIM,
FED REP GERMANY; WILHELM WANKE, HEIDENHEIM,
FED REP GERMANY; HANS-JURGEN WULZ, HEIDENHEIM,
FED REP GERMANY; RUDOLF BUCK, HEIDENHEIM, FED REP GERMANY,
DECEASED; BY ELSE BUCK, HEIDENHEIM, FED REP GERMANY,
LEGAL REPRESENTATIVE.

CONTINUING DATA AS CLAIMED BY APPLICANT-

THIS APPLN IS A CON OF 08/286,948 08/08/94 PAT 5,500,091
WHICH IS A CON OF 08/055,918 04/29/93 PAT 5,389,206
WHICH IS A CON OF 07/773,965 11/12/91

FOREIGN/PCT APPLICATIONS-FED REP GERMANY P 39 27 597.3 08/22/89

TITLE

TWIN WIRE FORMER

PRELIMINARY CLASS: 140

RECEIVED
36 AUG -2 PM 2:05
GROUP 130

15/20/98 11:11 FAX 212 382 0988

OSTROLENK FABER
PAGE 2

008/007

UNITED STATES OF AMERICA		OPGS FILE NO.
18 COMBINED DECLARATION AND POWER OF ATTORNEY		P/14-363
FOR CONTINUING APPLICATION		
<p>I hereby appoint OSTROLENK, FABER, GERB & SOFFEN and the members of the Firm, Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Berliner—Reg. No. 18,653; Robert C. Faber—Reg. No. 24,322; Edward A. Meilman—Reg. No. 24,735; Stanley H. Lieberstein—Reg. No. 22,400; Steven I. Weisburd—Reg. No. 27,409; Sfax Moskowitz—Reg. No. 30,576; Stephen A. Soffen—Reg. No. 31,063; and James A. Finder—Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith, and to receive all correspondence.</p> <p>SEND CORRESPONDENCE TO:</p> <p style="text-align: center;">OSTROLENK, FABER, GERB & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NEW YORK 10036-8403 DIRECT TELEPHONE CALLS TO: (212) 382-0700</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>		
Full name of Sole or First Inventor	Inventor's Signature	Date
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Post Office Address		
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Full name of Fifth Joint Inventor	Inventor's Signature	Date
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Post Office Address		
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CONTINUED ON PAGE 3

OPGS FORM DE2 (79)

Stomach Correction



OSTROLENK, FABER, GERB & SOFFEN, LLP

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WASHINGTON OFFICE

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WASHINGTON, D.C. 20006
TEL 202 457 7785
FAX 202 429 8919

July 25, 1996

Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Att: Application Processing Division's
Customer Correction Branch

Re: Applicant No. : 08/556,769
Filing Date : 11/2/95
Title : TWIN WIRE FORMER
Our File : P/14-363

RECEIVED
JUL 26 1996
DIVISION 100

Dear Sir:

We have just received a "duplicate" of the original filing receipt you sent to us.

The error is still present in the address of applicant WERNER KADE. On July 11, 1996 we requested that his address be changed to say NEENAH, WISCONSIN, USA. A copy of that letter and page 2 of the Declaration are enclosed.

Please make this change and send us a "corrected" filing receipt.

Very truly yours,

OSTROLENK FABER GERB & SOFFEN, LLP

M. Pfeffer
Martin Pfeffer

MP:BF
Enc.

PTO-103X
(Rev. 8-95)FILING RECEIPT
DUPLICATE

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	GRP ART UNIT	FIL FEE REC'D	ATTORNEY DOCKET NO.	DRWGS	TOT CL	IND CL
08/556,769	11/02/95	3201	\$1,122.00	P/14-363	2	30	3

OSTROLENK FABER GERB & SOFFEN
1180 AVENUE OF THE AMERICAS
NEW YORK NY 10036-8403

Receipt is acknowledged of this nonprovisional Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please write to the Application Processing Division's Customer Correction Branch within 10 days of receipt. Please provide a copy of the Filing Receipt with the changes noted thereon.

Applicant(s)

DIETER EGELHOF, HEIDENHEIM, FED REP GERMANY; KLAUS
HENSELER, HEIDENHEIM, FED REP GERMANY; WERNER KADE,
NEENAH, FED REP GERMANY; ALBRECHT MEINECKE, HEIDENHEIM,
FED REP GERMANY; WILHELM WANKE, HEIDENHEIM,
FED REP GERMANY; HANS-JURGEN WULZ, HEIDENHEIM,
FED REP GERMANY; RUDOLF BUCK, HEIDENHEIM, FED REP GERMANY,
DECEASED; BY ELSE BUCK, HEIDENHEIM, FED REP GERMANY,
LEGAL REPRESENTATIVE.

CONTINUING DATA AS CLAIMED BY APPLICANT-

THIS APPLN IS A CON OF 08/286,948 08/08/94 PAT 5,500,091
WHICH IS A CON OF 08/055,918 04/29/93 PAT 5,389,206
WHICH IS A CON OF 07/773,965 11/12/91

FOREIGN/PCT APPLICATIONS-FED REP GERMANY P 39 27 597.3 08/22/89

TITLE

TWIN WIRE FORMER

PRELIMINARY CLASS: 140

RECEIVED
JUL 29 1996
GROUP 100

(see reverse)

05/20/98 13:13 FAX 212 38 0953

OSTROLENK FABER
PAGE 2

006/007

UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR CONTINUING APPLICATION		OFFICE FILE NO. P/14-363
<p>I hereby appoint OSTROLENK, FABER, GERB & SOFFEN and the members of the Firm, Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Berliner—Reg. No. 18,653; Robert C. Faber—Reg. No. 24,322; Edward A. Meilman—Reg. No. 24,735; Stanley H. Lieberstein—Reg. No. 22,400; Steven L. Weisburd—Reg. No. 27,409; Max Moskowitz—Reg. No. 30,576; Stephen A. Soffen—Reg. No. 31,063; and James A. Finder—Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.</p> <p>SEND CORRESPONDENCE TO: OSTROLENK, FABER, GERB & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NEW YORK 10035-9403 DIRECT TELEPHONE CALLS TO: (212) 382-0700</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>		
Full name of Sole or First Inventor Dieter Egelhof	Inventor's Signature	Date
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Lucas-Cranach-Str. 15, D-7920 Heidenheim, Germany		
Full name of Second Joint Inventor Klaus Renseler	Inventor's Signature	Date
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Wildstr. 20, D-7920 Heidenheim, Germany		
Full name of Third Joint Inventor Werner Kade	Inventor's Signature	Date 5/20/98
Residence Neeenah, Wisconsin 54956	Country of Citizenship Germany	
Post Office Address 521 Harbor Light Court, Neeenah, Wisconsin 54956, USA		
Full name of Fourth Joint Inventor Albrecht Meinecke	Inventor's Signature	Date
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Hans-Kolbein-Str. 39, D-7920 Heidenheim, Germany		
Full name of Fifth Joint Inventor Wilhelm Wanke	Inventor's Signature	Date
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Donauschwabenstr. 47, D-7920 Heidenheim, Germany		

OFFICE FORM DEZ (79)

CONTINUED ON PAGE 3

July 11, 1996

Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Att: Application Processing Division's
Customer Correction Branch

Re: Application No. : 08/556,769
Filing Date : 11/3/95
Title : TWIN WIRE FORMER
Our File : P/14-363

Dear Sir:

Please note an error in the address of applicant WERNER KADE. AS
shown on page 2 of the Declaration, copy enclosed, his address is
NEENAH, WISCONSIN, USA.

Please make this change and send us a corrected filing receipt.

Very truly yours,

OSTROLENK FABER GERE & SOFFEN, LLP

MP:BF
Enc.

Martin Pfeffer

DATE: 8/22/96

FROM: CUSTOMER CORRECTIONS
APPLICATION PROCESSING DIVISION
Loc. 0380

SUBJ: APPLICATION FILES NEEDED FOR
CORRECTION/UPDATE

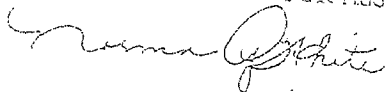
GROUP ART UNIT: 1303

APPLICATION NUMBER 08/556,769 IS NEEDED
IMMEDIATELY FOR CORRECTION.

PLEASE ATTACH THIS FORM TO THE ABOVE APPLICATION AND
RETURN IT TO THE APPLICATION PROCESSION DIVISION,
CUSTOMER'S CORRECTION CP2- ROOM 6C17.

IF YOU ARE UNABLE TO LOCATE THE APPLICATION OR HAVE A
QUESTION, PLEASE CALL ME AT 308-3618.

THANK YOU FOR YOUR ASSISTANCE



NORMA WHITE
SUPERVISOR


**UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office**

 Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
---------------	-------------	----------------------	---------------------

05/15/1993 11/02/93 174010P

1941/1904

 OSTILENKI PAPER CO. & SOFFEN
1100 AVENUE OF THE AMERICANS
NEW YORK NY 10008-5403

EXAMINER	
HASTINGS, R.	
ART UNIT	PAPER NUMBER
	6

 1003
DATE MAILED:

10/01/96

 This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

☒ This application has been examined ☒ Responsive to communication filed on 9-12-96 ☐ This action is made final.

 A shortened statutory period for response to this action is set to expire 3 month(s), — days from the date of this letter.
Failure to respond within the period for response will cause the application to become abandoned, 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

- | | |
|---|--|
| 1. <input checked="" type="checkbox"/> Notice of References Cited by Examiner, PTO-892. | 2. <input checked="" type="checkbox"/> Notice of Draftsman's Patent Drawing Review, PTO-948. |
| 3. <input checked="" type="checkbox"/> Notice of Art Cited by Applicant, PTO-1449. | 4. <input type="checkbox"/> Notice of Informal Patent Application, PTO-152. |
| 5. <input type="checkbox"/> Information on How to Effect Drawing Changes, PTO-1474. | 6. <input type="checkbox"/> |

Part II SUMMARY OF ACTION

1. ☒ Claims 1-31 are pending in the application.
- Of the above, claims _____ are withdrawn from consideration.
2. ☐ Claims _____ have been cancelled.
3. ☐ Claims _____ are allowed.
4. ☒ Claims 1-31 are rejected.
5. ☐ Claims _____ are objected to.
6. ☐ Claims _____ are subject to restriction or election requirement.
7. ☐ This application has been filed with informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes.
8. ☐ Formal drawings are required in response to this Office action.
9. ☐ The corrected or substitute drawings have been received on _____. Under 37 C.F.R. 1.84 these drawings are ☐ acceptable; ☐ not acceptable (see explanation or Notice of Draftsman's Patent Drawing Review, PTO-948).
10. ☐ The proposed additional or substitute sheet(s) of drawings, filed on _____, has (have) been ☐ approved by the examiner; ☐ disapproved by the examiner (see explanation).
11. ☐ The proposed drawing correction, filed _____, has been ☐ approved; ☐ disapproved (see explanation).
12. ☒ Acknowledgement is made of the claim for priority under 35 U.S.C. 119. The certified copy has ☐ been received; ☐ not been received.
☒ been filed in parent application, serial no. 055919; filed on 4/29/93
13. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.
14. ☐ Other

EXAMINER'S ACTION

Serial Number: 08/556,769

-2-

Art Unit: 1303

Claims 1-31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1, 29, 30 line 8 "of a substantial length" is relative and thus indefinite; how long/short may be length be to be substantial/not substantial? This phrase must be deleted. Furthermore the original specification teaches "without a single wire predrainage zone" The addition of "at least without... of any substantial length is deemed to be new matter not supported by the original specification, thus WO 91/02842 is available as prior art against these claims.

Claim 1 it is unclear which strips first and second means for collecting water is meant for, all of the first and second drainage strips are implied in the current language, yet that is not clear nor supported by the specification. It appears that --second-- should be inserted before "drainage" on line 33 and line 36 of claim 1 to be clear and consistent with the specification.

Claim 10 line 2 delete the quotation marks as unnecessary.

The non-statutory double patenting rejection, whether of the obviousness-type or non-obviousness-type, is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or

Serial Number: 08/556,769

-3-

Art Unit: 1303

improper timewise extension of the "right to exclude" granted by a patent. *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); and *In re Goodman*, 29 USPQ2d 2010 (Fed. Cir. 1993).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(b) and (c) may be used to overcome an actual or provisional rejection based on a non-statutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.78(d).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-31 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-18 and claims 1, 2 of U.S. Patent No. 5,389,206 and 5,500,091, respectively. Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant claims are merely of slightly differing scope from those of the two patents; for example it would have been prima facie obvious to eliminate the stationary feature of claim 1, of '206 patent or to use first and second means for collecting water as claimed in claim 1 of this case as such is conventional and well known to the artisan and in any event this feature was disclosed in both '206 and '091 specification and could have been claimed in those cases.

Claims 1-31 are rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103 as

Serial Number: 08/556,769

-4-

Art Unit: 1303

obvious over WO 91/02842 or under 35 USC 103 as obvious over WO 842 in view of Halme et al.

Each independent claim contains a limitation not disclosed in the parent specification re: "neither wise belt defining a single wire predrainage zone of a substantial length" (emphasis provided) Applicants are therefore only entitled to the instant filing date of Nov 25, 1995 for these claims and WO '842 is available as prior art. See In re Van Langehoven 173 USPQ 426.

WO 842 teaches everything in these claims except there is no single wire predrainage zone which is encompassed by the language. However the language also encompasses that there can be a predrainage zone and if necessary Halme et al is cited as teaching the alternative of a gap former with no single wire predrainage zone or having such a zone. Thus it would have been prima facie obvious to have such a zone in WO '842 as a known alternative configuration in this art.

Claims 1-4, 7-28 and 31 are rejected under 35 U.S.C. § 103 as being unpatentable over Tissari or Koski in view of DE '133, further in view of Nyman or WO 86/04368 or Nevalainen et al.

Tissari, especially Fig 6, shows almost every feature of claim 1 except it does not specify that strips 44 are resiliently supported or first/second means for collecting water,

Serial Number: 08/556,769

-5-

Art Unit: 1303

Likewise Koski shows almost every feature of claim 1 except resilient support of strips 17 or 37 (note one can view Koski either roll 21 or roll 15 as curved drainage element and then strips 17 or 37 respectively as strips in same belt loop as curved drainage element) and first and second means for collecting water.

However the artisan is well aware of the option and advantages of resiliently supported strips, means for collecting water, and vacuum means (claim 9) as evidenced by DE '133. Thus it would have been prima facie obvious to resiliently support at least one or more of the appropriate strips in either reference for the known advantages of same. Furthermore to use vacuum means (claim 9) for the well known advantage of increased dewatering is also prima facie obvious to the artisan and is simply suggested by both DE '133 and Tissari or Koski when viewed as a whole; see for example Tissari col 7 line 59 to col 8 line 2. Note DE '133 Fig 3 can have suction in both the upper and/or lower box to aid dewatering.

In addition, when using vacuum for the second upper drainage strips especially, it is well known and conventional to use a separate collecting means for the first strip versus all the other strips - see for example Nyman's first slot for first strip

Serial Number: 08/556,769

-6-

Art Unit: 1303

versus subsequent collecting means, WO 86/04368 also depicts this feature as well as Nevalainen et al. Also to have individual water collectors for each strip is suggested by Tissari Fig 5 element 40.

Furthermore, even without a reference, providing means to collect water stripped off by dewatering elements is conventional in this art, and absent evidence of unexpected results of criticality, to optimize how many and where the means for collecting water are located would have been prima facie obvious.

Claims 5 and 6 would be allowable if rewritten to overcome the rejection under 35 U.S.C. 112 ^{and the obvious type patenting rejection} and to include all of the

limitations of the base claim and any intervening claims

(Claims 21, 30 are allowable, if a terminal disclaimer is filed to overcome obvious type double patenting rejection)
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Exr. Hastings whose telephone number is (703) 308-0470. The examiner can normally be reached on Monday-Thursday from 6:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Don Czaja, can be reached on (703) 308-3852. The fax phone number for this Group is (703) 305-7115.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0651.

Exr Hastings/krb
October 3, 1996

Exr Hastings
HASTINGS
EXAMINER
ART UNIT 1303
10-4-96

TO SEPARATE, HOLD TOP AND BOTTOM EDGES, SNAP-APART AND DISCARD CARBON

FORM PTO-892 (REV. 2-92)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		SERIAL NO. <u>536,769</u> 508,210	GROUP/ART UNIT <u>1303</u>	ATTACHMENT TO PAPER NUMBER <u>6</u>			
NOTICE OF REFERENCES CITED				APPLICANT(S) <u>Buck et al</u>					
U.S. PATENT DOCUMENTS									
*		DOCUMENT NO.	DATE	NAME	CLASS	SUB-CLASS	FILING DATE IF APPROPRIATE		
✓	A	<u>5500091</u>	<u>3-96</u>	<u>Buck et al</u>	<u>162</u>	<u>301</u>			
	B	<u>5185064</u>	<u>2-93</u>	<u>Nyman</u>	<u>162</u>	<u>301</u>	<u>9-88</u>		
	C								
	D								
	E								
	F								
	G								
	H								
	I								
	J								
	K								
FOREIGN PATENT DOCUMENTS									
*		DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS	SUB-CLASS	PERTINENT SHTS. DWG.	PP. SPEC.
✓	L	<u>91102842</u>	<u>3-91</u>	<u>PCT</u>	<u>—</u>	<u>162</u>	<u>301</u>		
	M								
	N								
	O								
	P								
	Q								
OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)									
	R								
	S								
	T								
	U								
EXAMINER <u>Hastings</u>			DATE <u>9-96</u>						
* copy of this reference is not being furnished with this office action. (See Manual of Patent Examining Procedure, section 707.05 (a).)									

Form PTO 948 (Rev. 10-94)

U.S. DEPARTMENT OF COMMERCE - Patent and Trademark Office

Application No. 556769

NOTICE OF DRAFTSPERSON'S PATENT DRAWING REVIEW

PTO Draftpersons review all originally filed drawings regardless of whether they are designated as formal or informal. Additionally, patent Examiners will review the drawings for compliance with the regulations. Direct telephone inquiries concerning this review to the Drawing Review Branch, 703-305-8404.

The drawings filed (insert date) 11/2/98 am
 A. ☒ not objected to by the Draftsperson under 37 CFR 1.84 or 1.152.
 B. ☐ objected to by the Draftsperson under 37 CFR 1.84 or 1.152 as indicated below. The Examiner will require submission of new, corrected drawings when necessary. Corrected drawings must be submitted according to the instructions on the back of this Notice.

1. DRAWINGS. 37 CFR 1.84(a): Acceptable categories of drawings:

Black ink Color

☐ Not black solid lines. Fig(s) _____☐ Color drawings are not acceptable until petition is granted.

Fig(s) _____

2. PHOTOGRAPHS. 37 CFR 1.84(b)

☐ Photographs are not acceptable until petition is granted.

Fig(s) _____

☐ Photographs not properly mounted (must use crystal board or photographic double-weight paper). Fig(s) _____☐ Poor quality (half-tone). Fig(s) _____

3. GRAPHIC FORMS. 37 CFR 1.84(d)

☐ Chemical or mathematical formulas not labeled as separate figure.

Fig(s) _____

☐ Group of waveforms not presented as a single figure, using common vertical axis with time extending along horizontal axis.

Fig(s) _____

☐ Individual waveforms not identified with a separate letter designation adjacent to the vertical axis. Fig(s) _____

4. TYPE OF PAPER. 37 CFR 1.84(e)

☐ Paper not flexible, strong, white, smooth, nonshiny, and durable.

Sheet(s) _____

☐ Bubbles, alterations, overwritings, interlineations, cracks, creases, and folds copy machine marks not accepted. Fig(s) _____☐ Mylar, vellum paper is not acceptable (too thin). Fig(s) _____

5. SIZE OF PAPER. 37 CFR 1.84(f): Acceptable sizes:

21.6 cm. by 35.6 cm. (8 1/2 by 14 inches)

21.6 cm. by 33.1 cm. (8 1/2 by 13 inches)

21.6 cm. by 27.9 cm. (8 1/2 by 11 inches)

21.6 cm. by 29.7 cm. (DIN size A4)

☐ All drawing sheets not the same size. Sheet(s) _____☐ Drawing sheet not an acceptable size. Sheet(s) _____

6. MARGINS. 37 CFR 1.84(g): Acceptable margins:

Paper size

21.6 cm. X 35.6 cm. (8 1/2 X 14 inches) (8 1/2 X 11 inches) (DIN Size A4)

T 5.1 cm. (2") 2.5 cm. (1") 2.5 cm. (1") 2.5 cm.

L .64 cm. (1/4") .64 cm. (1/4") .64 cm. (1/4") 2.5 cm.

R .64 cm. (1/4") .64 cm. (1/4") .64 cm. (1/4") 1.5 cm.

B .64 cm. (1/4") .64 cm. (1/4") .64 cm. (1/4") 1.0 cm.

Margins do not conform to chart above.

Sheet(s) _____

Top (T) _____ Left (L) _____ Right (R) _____ Bottom (B) _____

7. VIEWS. 37 CFR 1.84(h)

REMARK: Specification may require revision to correspond to drawing changes.

☐ All views not grouped together. Fig(s) _____☐ Views connected by projection lines or lead lines.

Fig(s) _____

☐ Partial views. 37 CFR 1.84(h) 2☐ View and enlarged view not labeled separately or properly.

Fig(s) _____

☐ Sectional views. 37 CFR 1.84 (h) 3☐ Hatching not indicated for sectional portions of an object.

Fig(s) _____

☐ Cross section not drawn same as view with parts in cross section with regularly spaced parallel oblique strokes. Fig(s) _____

8. ARRANGEMENT OF VIEWS. 37 CFR 1.84(i)

☐ Words do not appear on a horizontal, left-to-right fashion when page is either upright or turned so that the top becomes the right side, except for graphs. Fig(s) _____

9. SCALE. 37 CFR 1.84(k)

☐ Scale not large enough to show mechanism with crowding when drawing is reduced in size to two-thirds in reproduction.

Fig(s) _____

☐ Indication such as "actual size" or scale 1/2" not permitted.

Fig(s) _____

10. CHARACTER OF LINES, NUMBERS, & LETTERS. 37 CFR 1.84(l)

☐ Lines, numbers & letters not uniformly thick and well defined, clean, durable, and black (except for color drawings).

Fig(s) _____

11. SHADING. 37 CFR 1.84(m)

☐ Solid black shading areas not permitted.

Fig(s) _____

☐ Shade lines, pale, rough and blurred. Fig(s) _____

12. NUMBERS, LETTERS, & REFERENCE CHARACTERS. 37 CFR 1.84(p)

☐ Numbers and reference characters not plain and legible. 37 CFR 1.84(p)(1) Fig(s) _____☐ Numbers and reference characters not oriented in same direction as the view. 37 CFR 1.84(p)(1) Fig(s) _____☐ English alphabet not used. 37 CFR 1.84(p)(2)

Fig(s) _____

☐ Numbers, letters, and reference characters do not measure at least .32 cm. (1/8 inch) in height. 37 CFR(p)(3)

Fig(s) _____

13. LEAD LINES. 37 CFR 1.84(g)

☐ Lead lines cross each other. Fig(s) _____☐ Lead lines missing. Fig(s) _____

14. NUMBERING OF SHEETS OF DRAWINGS. 37 CFR 1.84(i)

☐ Sheets not numbered consecutively, and in Arabic numerals, beginning with number 1. Sheet(s) _____

15. NUMBER OF VIEWS. 37 CFR 1.84(u)

☐ Views not numbered consecutively, and in Arabic numerals, beginning with number 1. Fig(s) _____☐ View numbers not preceded by the abbreviation Fig.

Fig(s) _____

16. CORRECTIONS. 37 CFR 1.84(w)

☐ Corrections not made from prior PTO-948.

Fig(s) _____

17. DESIGN DRAWING. 37 CFR 1.152

☐ Surface shading shown not appropriate. Fig(s) _____☐ Solid black shading not used for color contrast.

Fig(s) _____

COMMENTS:

ATTACHMENT TO PAPER 100

DATE

6/27/98

390 116 CP/303
P/14-363 #7/BM
4-9

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of: Rudolf BUCK et al. Date: March 4, 1997
Serial No.: 08/556,289 Group Art Unit: 1303
Filed: November 2, 1995 Examiner: K. Hastings
For: TWIN WIRE FORMER

Hon. Commissioner of Patents and Trademarks
Washington, D.C. 20231

PETITION AND FEE FOR AUTOMATIC EXTENSION OF TIME
UNDER 37 CFR 1.17, 1.136(a) AND 35 USC 41(a)8

Sir:

Applicants hereby petition the Commissioner of Patents and Trademarks to extend the time for filing a response to the outstanding Office Action by two (2) months. Enclosed is our check No. 64313 which includes the amount of \$390.00 for the petition fee in accordance with 37 CFR 1.17 computed as:

XX Response within second month
XX not small entity (\$390) small entity (\$195)

You are authorized to charge to our Deposit Account No. 15-0700 any additional amounts owing.

If this petition is inadequate to avoid abandonment, the Commissioner of Patents and Trademarks is petitioned, under 37 C.F.R. §1.136(a), to extend the time by the number of months which will avoid abandonment under 37 C.F.R. §1.135. The fee under 37 C.F.R. § 1.17 should be charged to our Deposit Account No. 15-0700.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on March 4, 1997:

Martin Pfeffer

Name of applicant, assignee or
Registered Representative

Signature
March 4, 1997
Date of Signature

Respectfully submitted,

Martin Pfeffer

Registration No.: 20,808.
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 Avenue of the Americas
New York, New York 10036-8403
Telephone: (212) 382-0700



24C

D 2 C P 1303
#B/BM
8/4-1-97
P/14-363

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of
Rudolf BUCK et al.
Serial No.: 08/556,769
Filed: November 2, 1995
For: TWIN WIRE FORMER

New York, New York
Date: March 4, 1997
Group Art Unit: 1303
Examiner: K. Hastings

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

AMENDMENT

Sir:

Responsive to the Office Action dated October 4, 1996,
please amend the above-identified application as follows:

IN THE CLAIMS:

Please cancel claims 1-4, 7-28 and 31 without
prejudice.

Please amend the claims as follows:

1. 5. (Amended) A twin-wire former for the production of
a paper web from a fiber suspension, the twin wire former
comprising:

first and second web forming wire belts, means for
directing the wire belts to travel along a path together for
forming a twin wire zone of the twin wire former, with the web
between the wire belts as the wire belts travel along the path
through the twin wire zone, neither wire belt defining a single
wire predrainage zone;

each wire belt forming an endless loop;
the twin wire zone having a first section which
includes a first drainage element at the start of the path

through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt;

first means for collecting the water drained from the fiber suspension by the most upstream one of the drainage strips;

second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element. [The twin wire former of claim 1, wherein] the twin wire zone being [is] free of rolls which deflect the twin wire zone.

2.9 (Amended) A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt;

first means for collecting the water drained from the fiber suspension by the most upstream one of the drainage strips;

second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and

the twin wire zone having a third section following the second section along the path of the wire belts through the twin

B¹
wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element. [The twin wire former of claim 1, wherein] the twin wire zone being [is] free of any forming rolls.

39. (Twice Amended) A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone [of a substantial length];

each wire belt forming an endless loop;

B²
the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the

strips contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips;

second support means supporting the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone being free of rolls which deflect the twin wire zone.

3²
4. (Twice Amended) A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone [of a substantial length];

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and

B²
are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips;

second support means supporting the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element; and

the twin wire zone being free of any forming rolls.

Please add the following new claims 32 and 33:

32. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

B³
first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a ^{single} first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire

zone; a curved drainage element in the first section, the curved drainage element having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the belts through the twin wire zone, the curved drainage element being engaged by one of the wire belts, for curving the path of the belts around the curved drainage element after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt; and

means for supplying a vacuum in the area of the second drainage strips;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section, for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone being free of guide rolls which deflect the twin wire zone and which cause a table roll effect.

33. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone; a curved drainage element in the first section, the curved drainage element having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the belts through the twin wire zone, the curved drainage element being engaged by one of the wire belts, for curving the path of the belts around the curved drainage element after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt; and

means for supplying a vacuum in the area of the second drainage strips;

3
B the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section, for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith;

the twin wire zone being free of solid rolls which deflect the twin wire zone and which cause a table roll effect.--

REMARKS

Applicants gratefully appreciate the allowability of claims 5, 6, 29 and 30.

Claims 5, 6, 29 and 30 have been amended to address the Examiner's rejection thereof under 35 U.S.C. §112 and, in the case of claims 5 and 6, to place these claims in independent form. With respect to the rejection under 35 U.S.C. §112 concerning lines 33 and 36 of claim 1, applicants respectfully submit that the present language is clear. Since it does not matter whether the most upstream one of the drainage strips is a first drainage strip or a second drainage strip, the interpretation given to the language by the Examiner is correct and is the intended meaning.

Claims 1-4, 7-28 and 31 have been cancelled and claims 32 and 33 have been added to more adequately protect applicants' invention.

With respect to the double patenting rejection, although applicants do not agree that this is well taken, in order to expedite prosecution of this application, applicants are enclosing herewith Terminal Disclaimers, one relating to U.S. Patent No. 5,389,206 and the other relating to U.S. Patent No. 5,500,091. Accordingly, it is respectfully requested that the rejection of claims 1-31 under the judicially created doctrine of obviousness type double patenting be withdrawn.

Claims 1-31 stand rejected under 35 U.S.C. §102(b) as anticipated by or, in the alternative, under 35 U.S.C. §103 as being obvious over WO91/02842 or 35 U.S.C. §103 as obvious over WO '842 in view of Halme et al. (U.S. Patent No. 3,994,774). Claims 5, 6, 29 and 30 have been amended to delete the phrase "of a substantial length". Accordingly, WO '842 is not available as prior art against claims 5, 6, 29 and 30. Applicants, therefore, request withdrawal of the rejection of claims 5, 6, 29 and 30 on this ground.

Claims 1-4, 7-28 and 31 were rejected under 35 U.S.C. §103 as being unpatentable over Tissari or Koski in view of DE '133, further in view of Nyman or WO 86/04368 or Nevalainen et al. All of these claims have been cancelled. Accordingly, this rejection is now moot.

With respect to new claims 32 and 33, it is respectfully submitted that these claims are patentable for the same reasons as claims 5, 6, 29 and 30. More specifically, claim 32 specifies that the twin wire zone is free of guide rolls which deflect the twin wire zone and which causes a table roll affect. Support for this limitation may be found on page 5, lines 32 to page 6.

With respect to claim 33 this is the same as claim 32 except "guide rolls" have been changed to "solid rolls". It is believed that this language is supported by the disclosure of a guide roll which, as is well known, has a smooth surface as compared to other rolls, such as forming rolls or suction rolls whose surfaces are generally perforated. Accordingly, it is respectfully submitted that the disclosure of the single species of a guide roll is sufficient support for applicants claim of a solid roll in claim 33. In this connection see MPEP §2164.03 which states:

A single embodiment may provide broad enablement in cases involving predictable factors, such as mechanical or electrical elements. In re Vickers, 141 F.2d 522, 61 USPQ 122 (CCPA 1944); In re Cook, 439 F.2d 730, 169 USPQ 298 (CCPA 1971).

Vickers was also cited as support for a predecessor of Section 2164.03 which stated that: "In mechanical cases, broad claims may properly be supported by a single form of an apparatus or structure". See In re Cook, supra at p. 301. Both Vickers and Cook further hold that the basis for this proposition is that in mechanical cases it is obvious from the disclosure of one species that other species will work, whereas the same is not true in non-predictable arts, such as chemical cases.

In view of the foregoing, it is respectfully submitted that this application is now in condition for allowance. Accordingly, reconsideration and allowance of the application are respectfully requested.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on March 4, 1997:

Martin Pfeffer

Name of applicant, assignee or
Registered Representative

Signature

March 4, 1997

Date of Signature

Respectfully submitted,



Martin Pfeffer

Registration No.: 20,808

OSTROLENK, FABER, GERB & SOFFEN, LLP

1180 Avenue of the Americas

New York, New York 10036-8403

Telephone: (212) 382-0700

MP:rdj:arr
Enclosures

P/14-363

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Rudolf BUCK et al.

Date: March 4, 1997

Serial No.: 08/556,769

Group Art Unit: 1303

Filed: November 2, 1995

Examiner: K. Hastings

For: TWIN WIRE FORMER

AMENDMENT TRANSMITTAL LETTER - FEE COMPUTATION

Hon. Commissioner of Patents and Trademarks
Washington, D.C. 20231

Transmitted herewith is an amendment in the above-identified application.

"Small Entity" status (37 C.F.R. §1.9 & §1.27) established
previously by enclosed verified statement.OFPS Check No. 6437, which includes the fee of \$ -0- calculated below, is attached.

NO. CLAIMS AFTER AMENDMENT	HIGHEST NO. PREVIOUSLY PAID FOR	EXTRA PRESENT	RATE	ADDIT. FEE
TOTAL 6 MINUS 20	*	=	x (\$11 SE or \$22)	\$
INDEF. 6 MINUS 3	**	=	3 x (\$40 SE or \$80)	\$240.00
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				x (\$130 SE or \$260) \$
* not less than 20 ** not less than 3				TOTAL \$240.00

In the event the actual fee is greater than the payment submitted or is inadvertently not enclosed or if any additional fee during the prosecution of this application is not paid, the Patent Office is authorized to charge the underpayment to Deposit Account No. 15-0700.

If this communication is filed after the shortened statutory time period had elapsed and no separate Petition is enclosed, the Commissioner of Patents and Trademarks is petitioned, under 37 C.F.R. §1.136(a), to extend the time for filing a response to the outstanding Office Action by the number of months which will avoid abandonment under 37 C.F.R. §1.135. The fee under 37 C.F.R. § 1.17 should be charged to our Deposit Account No. 15-0700.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on March 4, 1997:

Martin Pfeffer

Name of Registered Representative

Signature

March 4, 1997

Date of Signature

Respectfully submitted,

Martin Pfeffer

Registration No.: 20,808

OSTROLENK, FABER, GERB & SOFFEN, LLP

1180 Avenue of the Americas

New York, New York 10036

Telephone: (212) 382-0700

OFGS File No. P/14-363

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Rudolf Buck et al.

Serial No.: 08/556,769

Group Art Unit: 1303

Filed: November 2, 1995

Examiner: K. Hastings

For: TWIN WIRE FORMER

Hon. Commissioner of Patents and Trademarks
Washington, DC 20231

TERMINAL DISCLAIMER TO OBVIATE DOUBLE PATENTING
REJECTION (37 CFR §1.321(b))

Interest of Person Making This Disclaimer

I, Meinrad SCHAD

of J.M. Voith GmbH, with offices at
Sankt Pöltener Str. 43, ^{D-89522}~~Wxx922~~, Heidenheim, Germany, represent
that I am a representative authorized to sign on behalf of the
assignee identified below owning all of the interest in this
application.

Identity and Title of Disclaimant

The assignee is:

Name of assignee J.M. Voith GmbH

Address of assignee Sankt Pöltener Str. 43, ~~Wxx922~~ D-89522
Heidenheim, Germany

Name and title of disclaimant authorized to sign on behalf of
assignee:

Meinrad SCHAD

Head of General Legal Services

(Name)

(Title)

MSCN176231

230 FR 15-0700 04/01/97 08356769
23056 146 110.0000

Recordal of Assignment in PTO

The assignment was recorded on June 14, 1996, at Reel 7973, Frame 0629. Said document has been reviewed and, to the best of the assignee's knowledge and belief, title is in the assignee.

Disclaimer

J.M. Voith GmbH hereby disclaims the terminal part of any patent granted on the above-identified present application which would expire beyond the expiration date of the full statutory term of U.S. Patent No. 5,500,091; and


agrees that any patent so granted on the above-identified present application shall be enforceable only for and during such period that the legal title to said patent shall be the same as the legal title to U.S. Patent No. 5,500,091, this agreement to run with any patent granted on the above-identified present application and to be binding upon the grantee, its successors or assigns; and

does not disclaim any terminal part of any patent granted on said above-identified present application that would extend to the full statutory term of U.S. Patent No. 5,500,091 in the event that said issued patent later expires for failure to pay maintenance fee, is held unenforceable, is found invalid, is statutorily disclaimed in whole or terminally disclaimed under 37 C.F.R. 1.321(a), has all claims cancelled by a reexamination certificate, or is otherwise terminated prior to the expiration

of its statutory term, except for the separation of legal title
stated above.

17.12.1996

Date


Signature

MISC\170233

PJ4668 USC 2

OFGS File No. P/14-363

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Rudolf Buck et al.

Serial No.: 08/556,769

Group Art Unit: 1303

Filed: November 2, 1995

Examiner: K. Hastings

For: TWIN WIRE FORMER

Hon. Commissioner of Patents and Trademarks
Washington, DC 20231

TERMINAL DISCLAIMER TO OBVIATE DOUBLE PATENTING
REJECTION (37 CFR §1.321(b))

Interest of Person Making This Disclaimer

I, Meinrad SCHAD,

of J.M. Voith GmbH, with offices at
D-89522
Sankt Poltener Str. 43, WXXXXX, Heidenheim, Germany, represent
that I am a representative authorized to sign on behalf of the
assignee identified below owning all of the interest in this
application.

Identity and Title of Disclaimant

The assignee is:

Name of assignee J.M. Voith GmbH

Address of assignee Sankt Poltener Str. 43, ~~WXXXXX~~ D-89522
Heidenheim, Germany

Name and title of disclaimant authorized to sign on behalf of
assignee:

Meinrad SCHAD

Head of General Legal Services

(Name)

(Title)

Recordal of Assignment in PTO

The assignment was recorded on June 14, 1996, at Reel 7973, Frame 0629. Said document has been reviewed and, to the best of the assignee's knowledge and belief, title is in the assignee.

Disclaimer

J.M. Voith GmbH hereby disclaims the terminal part of any patent granted on the above-identified present application which would expire beyond the expiration date of the full statutory term of U.S. Patent No. 5,389,206; and

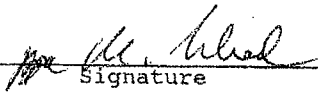
agrees that any patent so granted on the above-identified present application shall be enforceable only for and during such period that the legal title to said patent shall be the same as the legal title to U.S. Patent No. 5,389,206, this agreement to run with any patent granted on the above-identified present application and to be binding upon the grantee, its successors or assigns; and

does not disclaim any terminal part of any patent granted on said above-identified present application that would extend to the full statutory term of U.S. Patent No. 5,389,206 in the event that said issued patent later expires for failure to pay maintenance fee, is held unenforceable, is found invalid, is statutorily disclaimed in whole or terminally disclaimed under 37 C.F.R. 1.321(a), has all claims cancelled by a reexamination certificate, or is otherwise terminated prior to the expiration

of its statutory term, except for the separation of legal title
stated above.

17.12.1996

Date


Signature

MISC176231



UNITED STATES DEPARTMENT OF COMMERCE

Patent and Trademark Office

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
US 2007/012226	12/22/06	Ex. Hestings	PTOL-413

OS 11/11/06 10:00 AM
11/11/06 10:00 AM
11/11/06 10:00 AM

EXAMINER
Hestings

ART UNIT	PAPER NUMBER
10	10

DATE MAILED: 11/11/06

EXAMINER INTERVIEW SUMMARY RECORD

All participants (applicant, applicant's representative, PTO personnel):

(1) M. Heller (3) _____(2) Ex. Hestings (4) _____Date of Interview 4-9-07Type: ☒ Telephonic ☐ Personal (copy is given to ☐ applicant ☐ applicant's representative).Exhibit shown or demonstration conducted: ☐ Yes ☒ No. If yes, brief description: _____Agreement ☒ was reached with respect to some or all of the claims in question. ☐ was not reached.Claims discussed: 32, 33Identification of prior art discussed: Koski & Tissari

Description of the general nature of what was agreed to if an agreement was reached, or any other comments: It was agreed to cancel claim 33. Applicant proposed amending claim 32, which was accepted by the examiner - See Ex. Amoldt - to define that only the first drainage element ^{was} a forming roll, but no other rolls which reflect the ^{turn wire} zone are present such as in Koski (15)

(A fuller description, if necessary, and a copy of the amendments, if available, which the examiner agreed would render the claims allowable must be attached. Also, where no copy of the amendments which would render the claims allowable is available, a summary thereof must be attached.)

☒ 1. It is not necessary for applicant to provide a separate record of the substance of the interview.

Unless the paragraph below has been checked to indicate to the contrary, A FORMAL WRITTEN RESPONSE TO THE LAST OFFICE ACTION IS NOT WAIVED AND MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW (e.g., items 1-7 on the reverse side of this form). If a response to the last Office action has already been filed, then applicant is given one month from this interview date to provide a statement of the substance of the interview.

☐ 2. Since the examiner's interview summary above (including any attachments) reflects a complete response to each of the objections, rejections and requirements that may be present in the last Office action, and since the claims are now allowable, this completed form is considered to fulfill the response requirements of the last Office action. Applicant is not relieved from providing a separate record of the substance of the interview unless box 1 above is also checked.

and Tissari (22/12)

PTOL-413 (REV. 2-93)

Examiner's Signature

ORIGINAL FOR INSERTION IN RIGHT HAND FLAP OF FILE WRAPPER



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILED DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
---------------	------------	-----------------------	---------------------

EXAMINER

ART. UNIT	PAPER NUMBER
-----------	--------------

DATE MAILED:

NOTICE OF ALLOWABILITY

PART I.

1. ☒ This communication is responsive to And-B + Terminal Disclaimer
2. ☒ All the claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice Of Allowance And Issue Fee Due or other appropriate communication will be sent in due course.
3. ☒ The allowed claims are 5, 6, 29, 30, 32 (renumbered 1-5)
4. ☐ The drawings filed on _____ are acceptable.
5. ☐ Acknowledgment is made of the claim for priority under 35 U.S.C. 119. The certified copy has ☐ been received ☐ not been received. ☐ been filed in parent application Serial No. _____, filed on _____
6. ☒ Note the attached Examiner's Amendment.
7. ☒ Note the attached Examiner Interview Summary Record, PTOI-413.
8. ☐ Note the attached Examiner's Statement of Reasons for Allowance.
9. ☐ Note the attached NOTICE OF REFERENCES CITED, PTO-892.
10. ☐ Note the attached INFORMATION DISCLOSURE CITATION, PTO-1449.

PART II.

A SHORTENED STATUTORY PERIOD FOR RESPONSE to comply with the requirements noted below is set to EXPIRE THREE MONTHS FROM THE "DATE MAILED" indicated on this form. Failure to timely comply will result in the ABANDONMENT of this application. Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

1. ☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-152, which discloses that the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.
2. ☐ APPLICANT MUST MAKE THE DRAWING CHANGES INDICATED BELOW IN THE MANNER SET FORTH ON THE REVERSE SIDE OF THIS PAPER.
 - a. ☐ Drawing informalities are indicated on the NOTICE RE PATENT DRAWINGS, PTO-948, attached hereto or to Paper No. _____. CORRECTION IS REQUIRED.
 - b. ☐ The proposed drawing correction filed on _____ has been approved by the examiner. CORRECTION IS REQUIRED.
 - c. ☐ Approved drawing corrections are described by the examiner in the attached EXAMINER'S AMENDMENT. CORRECTION IS REQUIRED.
 - d. ☐ Formal drawings are now REQUIRED.

Any response to this letter should include in the upper right hand corner, the following information from the NOTICE OF ALLOWANCE AND ISSUE FEE DUE: ISSUE BATCH NUMBER, DATE OF THE NOTICE OF ALLOWANCE, AND SERIAL NUMBER.

Attachments:

- | | |
|---|--|
| <input checked="" type="checkbox"/> Examiner's Amendment | <input type="checkbox"/> Notice of Informal Application, PTO-152 |
| <input checked="" type="checkbox"/> Examiner Interview Summary Record, PTOI-413 | <input type="checkbox"/> Notice re Patent Drawings, PTO-948 |
| <input type="checkbox"/> Reasons for Allowance | <input type="checkbox"/> Listing of Bonded Draftsman |
| <input type="checkbox"/> Notice of References Cited, PTO 892 | <input type="checkbox"/> Other |
| <input type="checkbox"/> Information Disclosure Citation, PTO-1449 | |

Serial Number: 08/556,769

Page 2

Art Unit:

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Pfeffer on 4-23-97.

2. The application has been amended as follows:

Claim 33 has been canceled.

Claim 32, line 11 --single-- has been inserted before "first", and on the penultimate line after "zone" ⁴, apart from said first drainage element which is a single forming roll, ⁴ has been inserted, and "guide" has been deleted, and last line "and which...effect" has been deleted.

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Exr Hastings whose telephone number is (703) 308-0470.

kmh

April 24, 1997

Exr Hastings
KARLY M. HASTINGS
PATENT EXAMINER
ART UNIT 152
4-24-97



Corres. and Mail
BOX AF

#12/97-97
P/14-363

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Patent Application of

Rudolf BUCK et al.

Serial No.: 08/556,769

Filed: November 2, 1995

Allowed: April 25, 1997

For: TWIN WIRE FORMER

Date: June 17, 1997

Group Art Unit: 1303

Examiner: K. Hastings

Batch No.: M28

Hon. Commissioner of Patents and Trademarks
Washington, DC 20231
BOX ISSUE FEE

AMENDMENT PURSUANT TO 37 C.F.R. §1.312

Sir:

Responsive to the Notice of Allowance dated April 25, 1997, please further amend the application as follows:

IN THE CLAIMS:

Please amend claim 32, as amended by the Examiner's Amendment dated April 25, 1997, as follows:

32. (Twice Amended) A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a single first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge

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GROUP 1303

shaped entrance slot of the first section of the twin wire zone;
said single first drainage element in the first section[, the
 curved drainage element] being a single forming roll having an
 20 open surface to enable drainage of water from the fiber
 suspension and being curved along the path of the belts through
 the twin wire zone, the [curved drainage element] single forming
roll being engaged by one of the wire belts[,] for curving the
 path of the belts around the [curved drainage element] single
 25 forming roll after the entrance of the suspension into the
 entrance slot;

the twin wire zone having a second section following the
 first section along the path of the belts through the twin wire
 zone; in the second section, a plurality of first drainage strips
 30 are positioned within the loop of the first wire belt and are for
 contacting the first wire belt; in the second section, a
 plurality of second drainage strips are positioned within the
 loop of the second wire belt and are for contacting the second
 wire belt; the first strips being shifted in position along the
 path of the wire belts with respect to the second strips so that
 35 the first and second strips are offset and in a non-opposing
 relationship; first support means for resiliently supporting the
 first drainage strips against the respective wire belt that the
 strips contact;

40 second support means supporting the second drainage
 strips rigidly against the second wire belt; and
 means for supplying a vacuum in the area of the second
 drainage strips;

the twin wire zone having a third section following the
 45 second section along the path of the wire belts through the twin
 wire zone; a second drainage element in the third section, for
 being engaged by one of the wire belts as the wire belts travel
 over the second drainage element, the second drainage element
 having an open surface to enable water to be drained through the
 wire belt in contact therewith; and
 50

the twin wire zone apart from said [first drainage
 element which is a] single forming roll being free of rolls which
 deflect the twin wire zone.

REMARKS

The Examiner's Amendment amended the last two lines of claim 32 to recite that "the twin wire zone apart from said first drainage element which is a single forming roll being free of rolls which deflect the twin wire zone". Upon review of the claim it is believed that there may be some ambiguity because of the use of different terms to describe the same element. In particular, the single first drainage element, the curved drainage element and the single forming roll are one and the same element. Accordingly, the purpose of this amendment is to clarify that there is only a single first drainage element in the first section and that the single first drainage element is a single forming roll.

It is believed that this clarification of the claim language is consistent with the agreed upon Examiner's Amendment to the last two lines of claim 2.

In view of the foregoing, it is respectfully requested that this amendment be entered under the provisions 37 CFR §1.312.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on June 17, 1997:

Martin Pfeffer

Name of applicant, assigned or
Registered Representative

Signature

June 17, 1997

Date of Signature

Respectfully submitted,

Martin Pfeffer

Registration No.: 20,808

OSTROLENK, FABER, GERB & SOFFEN, LLP

1180 Avenue of the Americas

New York, New York 10036-8403

Telephone: (212) 382-0700

MP:arr

P/14-363

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Patent Application

Re: HUCK et al.

Serial No.: 08/556,769

Filed November 2, 1995

For: TWIN WIRE FORMER

Date: June 17, 1997

Group Art Unit: 1303

Examiner: K. Hastings



AMENDMENT TRANSMITTAL LETTER - FEE COMPUTATION

Hon. Commissioner of Patents and Trademarks
Washington, D.C. 20231

Transmitted herewith is an amendment in the
identified application.

_____ "Small Entity" status (37 C.F.R. §1.9 & §1.27) established
_____ previously _____ by enclosed verified statement.

OFCS Check No. _____, which includes the fee of \$ -0- calculated
below, is attached.

NO. CLAIMS AFTER AMENDMENT	HIGHEST NO. PREVIOUSLY PAID FOR	EXTRA PRESENT	RATE	ADDIT. FEE
TOTAL 5 MINUS 20	*	x	(\$11 SE or \$22)	\$
INDEP. 5 MINUS 5	**	x	(\$40 SE or \$80)	\$
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				x (\$130 SE or \$260) \$
* not less than 20 ** not less than 3				TOTAL \$ -0-

In the event the actual fee is greater than the payment submitted
or is inadvertently not enclosed or if any additional fee during
the prosecution of this application is not paid, the Patent Office
is authorized to charge the underpayment to Deposit Account No.
15-0700.

If this communication is filed after the shortened statutory time
period had elapsed and no separate Petition is enclosed, the
Commissioner of Patents and Trademarks is petitioned, under 37
C.F.R. §1.136(a), to extend the time for filing a response to the
outstanding Office Action by the number of months which will avoid
abandonment under 37 C.F.R. §1.135. The fee under 37 C.F.R. § 1.17
should be charged to our Deposit Account No. 15-0700.

I hereby certify that this correspondence is being
deposited with the United States Postal Service as
first-class mail in an envelope addressed to: Commis-
sioner of Patents and Trademarks, Washington, D.C.
20231, on June 17, 1997:

Martin Pfeffer

Name of Registered Representative

Signature

June 17, 1997

Date of Signature

Respectfully submitted,

Martin Pfeffer

Registration No.: 20,808

OSTROLENK, FABER, GERB & SOFFEN, LLP

1180 Avenue of the Americas

New York, New York 10036

Telephone: (212) 382-0700

TRAN205732

PART B—ISSUE FEE TRANSMITTAL

MAILING INSTRUCTIONS: This form should be used in transmitting the ISSUE FEE. Blocks 2 through 6 should be completed where appropriate. All further correspondence including the Issue Fee Receipt, the Patent, advance orders and notification of maintenance fees will be mailed to addressee entered in Block 1 unless you direct otherwise, by: (a) specifying a new correspondence address in Block 3 below; or (b) providing the PTO with a separate "FEE ADDRESS" for maintenance fee notifications with the payment of issue fee or thereafter. **See reverse for Certificate of Mailing, below.**

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending on the needs of the individual case. Any comments on the amount of time required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, D.C. 20231.

DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Box Issue Fee, Assistant Commissioner for Patents, Washington D.C. 20231

1. CORRESPONDENCE ADDRESS		2. INVENTOR(S) ADDRESS CHANGE (Complete only if there is a change)	
INVENTOR'S NAME		INVENTOR'S NAME	
Street Address		Street Address	
City, State and ZIP Code		City, State and ZIP Code	
CO-INVENTOR'S NAME		CO-INVENTOR'S NAME	
Street Address		Street Address	
City, State and ZIP Code		City, State and ZIP Code	
<input type="checkbox"/> Check if additional changes are enclosed			

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
09/05/1997	09/05/1997	60	1001	09/22/97
Named cant				

TITLE OF INVENTION

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
09/05/1997	09/05/1997	09/05/1997	09/05/1997	09/05/1997	1290.00	09/22/97

3. Correspondence address change (Complete only if there is a change)

09/05/1997 LBERGER 00000174 00556769
01 FC:142 1290.00 OP
02 FC:1551 30.00 OP

4. For printing on the patent front page, list the names of not more than 3 registered patent attorneys or agents OR, alternatively, the name of a firm having as a member a registered attorney or agent. If no name is listed, no name will be printed.

OSTROLENK, FABER, GERD & SOFFEN, LLP

5. ASSIGNMENT DATA TO BE PRINTED ON THE PATENT (print or type)

(2) ADDRESS (CITY, STATE OR COUNTRY)
Heidenheim, Germany

- A. ☐ This application is NOT assigned
☒ Assignment previously submitted to the Patent and Trademark Office.
☐ Assignment is being submitted under separate cover. Assignments should be directed to Box ASSIGNMENTS.

PLEASE NOTE: Unless an assignee is identified in Block 5, no assignee data will appear on the patent. Inclusion of assignee data is only appropriate when an assignment has been previously submitted to the PTO or is being submitted under separate cover. Completion of this form is NOT a substitute for filing an assignment.

6a. The following fees are enclosed:
☒ Issue Fee ☐ Advance Order - # of Copies 10

6b. The following fees should be charged to:

DEPOSIT ACCOUNT NUMBER
 (ENCLOSE A COPY OF THIS FORM)
☐ Issue Fee ☐ Advance Order - # of Copies
☐ Any Delinquencies in Enclosed Fees

The COMMISSIONER OF PATENTS AND TRADEMARKS is requested to apply the Issue Fee to the application identified above.

(Authorized Signature) Martin Pfeffer, RN 20,808 (Date) 07/22/97

NOTE: The Issue Fee will not be accepted from anyone other than the applicant, a registered attorney or agent, or the assignee or other party in interest as shown by the records of the Patent and Trademark Office.

Certificate of Mailing

Note: If this certificate of mailing is used, it can only be used to transmit the Issue Fee. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Box ISSUE FEE, Assistant Commissioner for Patents, Washington, D.C. 20231

on: July 22, 1997 (Date)
 Martin Pfeffer (Name of person making deposit)
 (Signature)
 July 22, 1997 (Date)

1. TRANSMIT THIS FORM WITH FEE

08/556769

5718805

Fig.1

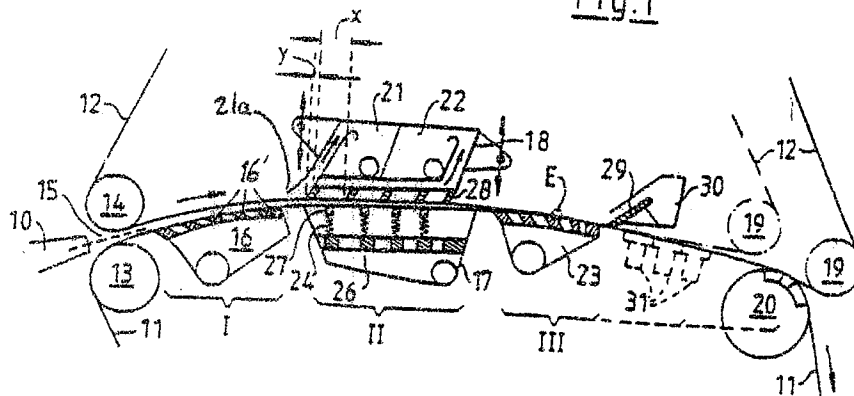


Fig.2

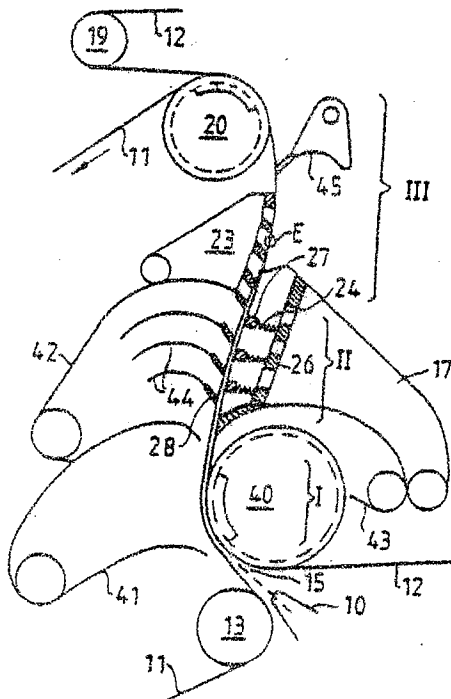
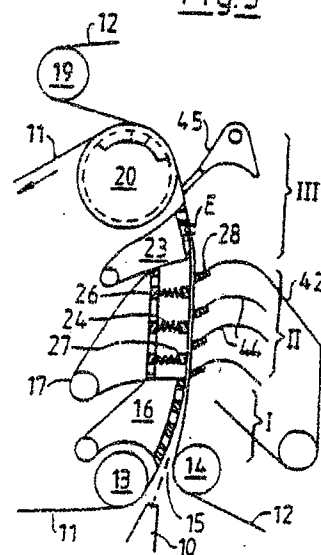


Fig.3



08/556769

Fig.4

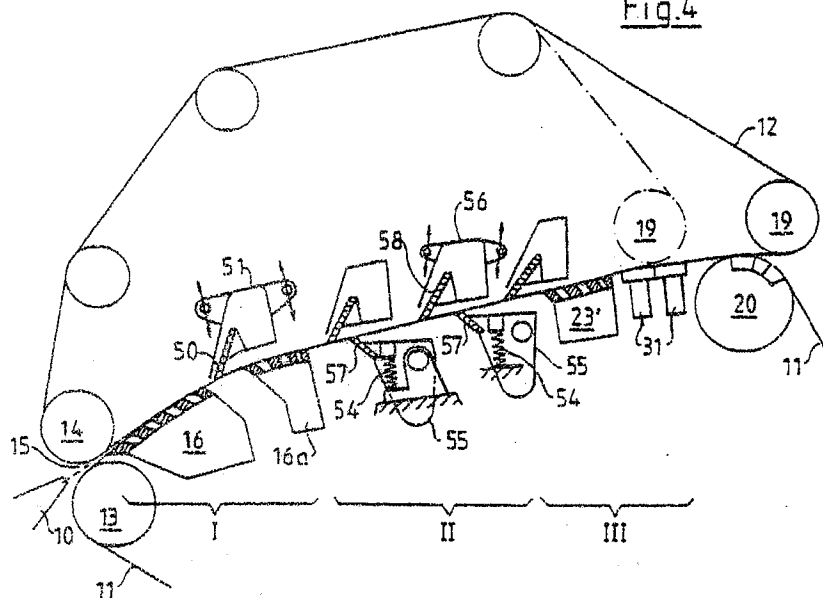
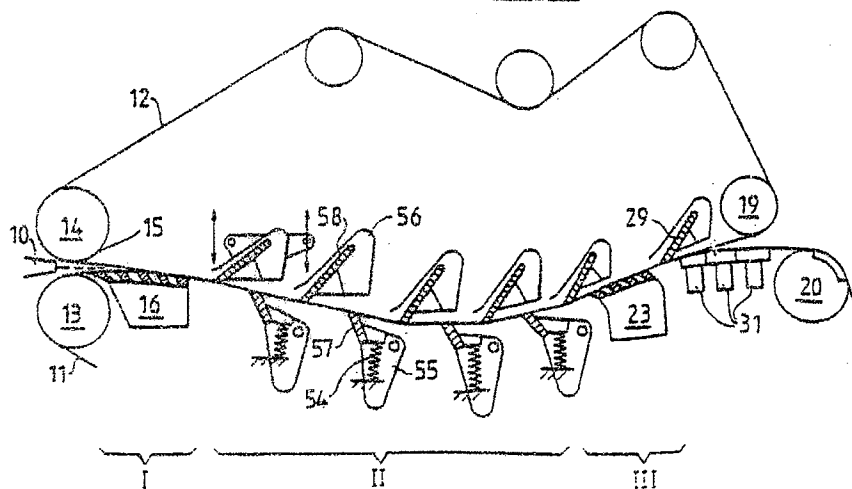


Fig.5





**UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office**

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
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EXAMINER

ART UNIT	PAPER NUMBER
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DATE MAILED:

13

- A. ☐ The petition filed _____ under 37 CFR 1.312(b) is granted.
The paper has been forwarded to the examiner for consideration on the merits.

- B. ☒ The amendment filed 6-20-97 under 37 CFR 1.312 has been considered, and has been:

1. ☐ entered
2. ☒ entered as directed to matters of form not affecting the scope of the invention (0.3311).
3. ☐ disapproved. A report appears below.
4. ☐ entered in part. A report appears below.

Report:

KM Hestberg

7-17-97

PLEASE FURNISH YOUR ZIP CODE IN ALL CORRESPONDENCE

PTO UTILITY GRANT

Paper Number 12

**The Commissioner of Patents
and Trademarks**

Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America for the term set forth below, subject to the payment of maintenance fees as provided by law.

If this application was filed prior to June 8, 1995, the term of this patent is the longer of seventeen years from the date of grant of this patent or twenty years from the earliest effective U.S. filing date of the application, subject to any statutory extension.

If this application was filed on or after June 8, 1995, the term of this patent is twenty years from the U.S. filing date, subject to an statutory extension. If the application contains a specific reference to an earlier filed application or applications under 35 U.S.C. 120, 121 or 365(c), the term of the patent is twenty years from the date on which the earliest application was filed, subject to any statutory extension.

Bence Lehman
Commissioner of Patents and Trademarks

Pamela Morton
Attest

The
United
States
of
America



Form PTO-1834 (Rev. 2/07)



1731
#16

P/14-363

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
In the Patent Application of New York, New York
Dieter EGELHOF, et al. Date: December 11, 1998
Patent No.: 5,718,805 Issued: February 17, 1998
For: TWIN WIRE FORMER

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

SUBMISSION PURSUANT TO 37 C.F.R §1.501

Sir:

The following patents have been cited to the patent owner as having pertinency to the claims of the above-identified patent:

- 1) U.S. Patent No.: 4,999,087;
- 2) U.S. Patent No.: 3,772,145;
- 3) U.S. Patent No.: 3,726,758;
- 4) U.S. Patent No.: 3,056,719; and
- 5) U.S. Patent No.: 3,582,467.

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GROUP 1700

These materials are merely to be placed in the file.
No fees are being paid and no fees are to be charged to our deposit account.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on December 11, 1998:

Respectfully submitted,

Martin Pfeffer, Esq.
Name of applicant, assignee or
Registered Representative

Signature
December 11, 1998
Date of Signature

Martin Pfeffer
Registration No.: 20,808
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 Avenue of the Americas
New York, New York 10036-8403
Telephone: (212) 382-0700

MP:jy
Enclosures

MISC281842

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

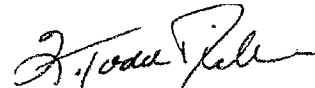
PATENT NO. : 5,818,805
DATED : October 6, 1998
INVENTOR(S) : Seiji Kobayashi, et. al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

At *Column 31, lines 29 to 30*: After the word "means", delete
"is reproduced from said information recording medium"

Signed and Sealed this
Ninth Day of March, 1999

Attest:



Q. TODD DICKINSON

Attesting Officer

Acting Commissioner of Patents and Trademarks

PATENT APPLICATION SERIAL NO ~~00~~/556769

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

NO. OF PAGES TO BE REPRODUCED
1 000 000.00 US 1/16/2008

PTO-1556
(5/87)

PATENT APPLICATION FEE DETERMINATION RECORD Effective October 1, 1995					Application or Docket Number 556769	
CLAIMS AS FILED - PART I						
(Column 1)		(Column 2)				
FOR	NUMBER FILED	NUMBER EXTRA				
BASIC FEE						
TOTAL CLAIMS		30 minus 20 = *		10		
INDEPENDENT CLAIMS		3 minus 3 = *				
MULTIPLE DEPENDENT CLAIM PRESENT						
<small>* If the difference in column 1 is less than zero, enter "0" in column 2</small> <i>* hold extra for amendment</i>						
CLAIMS AS AMENDED - PART II						
(Column 1)		(Column 2)		(Column 3)		
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA			
	Total	*	6	Minus	**	30
	Independent	*	6	Minus	***	3
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					
(Column 1)		(Column 2)		(Column 3)		
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA			
	Total	*		Minus	**	
	Independent	*		Minus	***	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					
(Column 1)		(Column 2)		(Column 3)		
AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA			
	Total	*		Minus	**	
	Independent	*		Minus	***	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					
<small> ** If the entry in column 1 is less than the entry in column 2, write "0" in column 3. *** If the "Highest Number Previously Paid For" in THIS SPACE is less than 20, enter "20." **** If the "Highest Number Previously Paid For" in THIS SPACE is less than 3, enter "3." The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1. </small>						

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
	375.00	OR		750.00
x\$11=		OR	x\$22=	220
x39=		OR	x78=	
+125=		OR	+250=	
TOTAL		OR	TOTAL	
			970	

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
x\$11=		OR	x\$22=	
x39=		OR	x78=	240.00
+125=		OR	+250=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
x\$11=		OR	x\$22=	
x39=		OR	x78=	
+125=		OR	+250=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

EXHIBIT

4

PART 1

09/161138

86/52/60

2012

Class	Subclass
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CLASSIFICATION

O.I.P.E. SCANNED <i>Sm</i> G.A. <i>mailed</i>	PATENT DATE OCT 26 1999
--	----------------------------

5972168

5972168

SECTOR	CLASS	SUBCLASS	ART UNIT	EXAMINER
	162	203	173	111 1111

FILED WITH: ☐ DISK (CRF) ☐ FICHE
(Attached in pocket on right inside flap)

MAY 20 2000

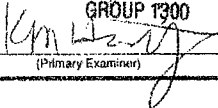
Abstract

ISSUING CLASSIFICATION

ORIGINAL						CROSS REFERENCE(S)						
CLASS			SUBCLASS			CLASS		SUBCLASS (ONE SUBCLASS PER BLOCK)				
INTERNATIONAL CLASSIFICATION												
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<input checked="" type="checkbox"/> TERMINAL DISCLAIMER	DRAWINGS			CLAIMS ALLOWED	
	Sheets Drwg. <div style="text-align: center; font-size: 2em;">2</div>	Figs. Drwg. <div style="text-align: center; font-size: 2em;">5</div>	Print Fig. <div style="text-align: center; font-size: 2em;">2</div>	Total Claims <div style="text-align: center; font-size: 2em;">8</div>	Print Claim for O.G. <div style="text-align: center; font-size: 2em;">1</div>
<input type="checkbox"/> a) The term of this patent subsequent to _____ (date) has been disclaimed. <input checked="" type="checkbox"/> b) The term of this patent shall not extend beyond the expiration date of U.S. Patent, No. <u>5298206</u> _____ _____	_____ (Assistant Examiner) (Date)			NOTICE OF ALLOWANCE MAILED	
	KAREN M. HASTINGS PRIMARY EXAMINER GROUP 1300  (Primary Examiner) (Date)			<div style="font-size: 2em; text-align: center;">3/24/99</div>	
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<input type="checkbox"/> c) The terminal _____ months of; this patent have been disclaimed.	_____ (Legal Instruments Examiner) (Date)			Amount Due <div style="font-size: 2em; text-align: center;">1210</div>	Date Paid <div style="font-size: 2em; text-align: center;">6/28/99</div>
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ISSUE FILE

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FILE NUMBER 09/161,138	FILING DATE 09/25/98	CLASS 162	GROUP ART UNIT 1731	ATTORNEY DOCKET NO. P/14-385
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DIETER EGELHOF, HEIDENHEIM, FED REP GERMANY; KLAUS HENSELER, HEIDENHEIM, FED REP GERMANY; WERNER KADE, NEEMAH, WI; ALBRECHT MEINECKE, HEIDENHEIM, FED REP GERMANY; WILHELM WANKE, HEIDENHEIM, FED REP GERMANY; HANS-JURGEN WULZ, HEIDENHEIM, FED REP GERMANY; RUDOLF BUCK, HEIDENHEIM, FED REP GERMANY, DECEASED; BY ELSE BUCK, HEIDENHEIM, FED REP GERMANY, LEGAL REPRESENTATIVE.

****CONTINUING DOMESTIC DATA*******

VERIFIED	THIS APPLN IS A CON OF	09/023,435 02/13/98 PAT	5,853,544
	WHICH IS A CON OF	08/556,769 11/02/95 PAT	5,718,805
	WHICH IS A CON OF	08/286,948 08/08/94 PAT	5,500,091
	WHICH IS A CON OF	08/055,918 04/29/93 PAT	5,389,206
	WHICH IS A CON OF	07/773,965 11/12/91 ABN	

****371 (NAT'L STAGE) DATA*******

VERIFIED	WHICH IS A 371 OF	PCT/EP90/01313 09/08/90
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****FOREIGN APPLICATIONS*******

VERIFIED	FED REP GERMANY	P 39 27 597.3	08/22/89
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IF REQUIRED, FOREIGN FILING LICENSE GRANTED 10/14/98

Foreign Priority claimed 35 USC 119 (a-d) conditions met	<input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> yes <input type="checkbox"/> no	Met after Allowance	STATE OR COUNTRY DEX	SHEETS DRAWING 2	TOTAL CLAIMS 8	INDEPENDENT CLAIMS 4
Verified and Acknowledged <u>EXAMINER'S INITIALS</u> <u>INITIALS</u>						

SEE CUSTOMER NUMBER: 002352

ADDRESS

TWIN WIRE FORMER

TITLE

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SERIAL NUMBER 09/161,138	FILING DATE 09/25/98	CLASS 162	GROUP ART UNIT 1731	ATTORNEY DOCKET NO. P/14-385
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APPLICANT
 DIETER EGELHOF, HEIDENHEIM, FED REP GERMANY; KLAUS HENSELER, HEIDENHEIM,
 FED REP GERMANY; WERNER KADE, NEENAH, WI; ALBRECHT HEINECKE, HEIDENHEIM,
 FED REP GERMANY; WILHELM WANKE, HEIDENHEIM, FED REP GERMANY; HANS-JURGEN
 WULZ, HEIDENHEIM, FED REP GERMANY; RUDOLF BUCK, HEIDENHEIM,
 FED REP GERMANY.

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FOREIGN APPLICATIONS***
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Foreign Priority claimed 35 USC 119 (a-d) conditions met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Met after Allowance	STATE OR COUNTRY DEX	SHEETS DRAWING 2	TOTAL CLAIMS 8	INDEPENDENT CLAIMS 4
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TWIN WIRE FORMER

TITLE

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SEARCHED				SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
Class	Sub.	Date	Exmr.		Date	Exmr.
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	300					
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	303					
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	352	12-98	kmbs			
		379	kmbs			
INTERFERENCE SEARCHED						
Class	Sub.	Date	Exmr.		Date	Exmr.
162	above	3-79	kmbs			

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POSITION	INITIALS	ID NO.	DATE
FEE DETERMINATION	BH	B36	10/2/98
O.I.P.E. CLASSIFIER	DM	10	10-5-98
FORMALITY REVIEW	DM	72223	10/14/98

INDEX OF CLAIMS

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Claim	Date
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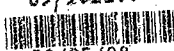
PATENT APPLICATION



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CONTENTS

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1. Application papers		42.	
2. <i>Prop. amend. to transmittal A</i>	9-25-98	43.	
3. <i>Prop. amend. to transmittal B</i>	9-25-98	44.	
4. <i>Key (S)</i>	1-4-99	45.	
5. <i>Fig 195</i>	12-11-98	46.	
6. <i>Amend C</i>	3-2-99	47.	
7. <i>Terminal Priorities</i>	3-2-99	48.	
8. <i>QUOTA LTR</i>	3-24-99	49.	
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US005972168A

United States Patent [19]

Egelhof et al.

[11] Patent Number: **5,972,168**[45] Date of Patent: **Oct. 26, 1999**[54] **TWIN WIRE FORMER**

[75] Inventors: Dieter Egelhof, Klaus Henseler, both of Heidenheim, Germany; Werner Kade, Neenah, Wis.; Albrecht Meinecke, Heidenheim, Germany; Wilhelm Wanke, Heidenheim, Germany; Hans-Jürgen Wulz, Heidenheim, Germany; Rudolf Bück, deceased, late of Heidenheim, Germany, by Elsie Bück, legal representative

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[73] Assignee: Voith Sulzer Papiertechnik Patent GmbH, Germany

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[21] Appl. No.: 09/161,138

[22] Filed: Sep. 25, 1998

Related U.S. Application Data

[62] Continuation of application No. 09/023,435, Feb. 13, 1998, which is a continuation of application No. 08/556,769, Nov. 2, 1995, Pat. No. 5,718,865, which is a continuation of application No. 08/286,948, Aug. 8, 1994, Pat. No. 5,500,091, which is a continuation of application No. 08/055,918, Apr. 29, 1993, Pat. No. 5,389,206, which is a continuation of application No. 07/773,965, abandoned, filed as application No. PCT/EP90/01313, Sep. 8, 1990.

[51] Int. Cl.⁶ D21F 1/00

[52] U.S. Cl. 162/203; 162/301

[58] Field of Search 162/203, 300, 162/301, 303, 348, 352

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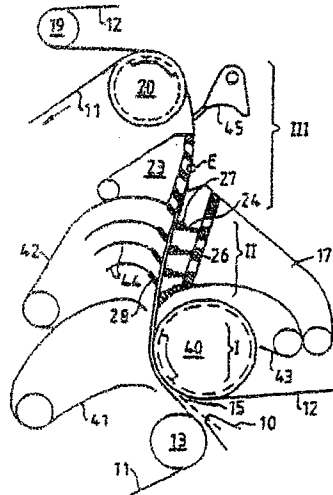
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Primary Examiner—Karen M. Hastings

Attorney, Agent, or Firm—Ostrolenk, Faber, Gerb & Soffen, LLP

[57] **ABSTRACT**

In a twin-wire former for the production of a paper web, two wire belts (11 and 12) together form a twin-wire zone which is divided into three sections (I, II and III). In the first section (I) the two wires (11, 12) travel over a curved forming shoe (16). They form there a wedge-shaped inlet slot (15) with which a headbox (10) is directly associated. In the second section (II), several resiliently supported strips (27) rest against the lower wire (11) and between each of said strips (27) a rigidly mounted strip (28) rests against the upper wire (12). In the third section (III) both wire belts (11, 12) pass over another curved forming shoe (23).

8 Claims, 2 Drawing Sheets

U.S. Patent

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Fig.1

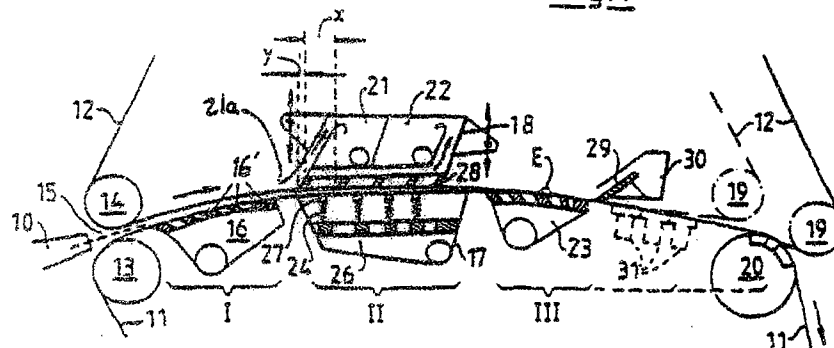


Fig.2

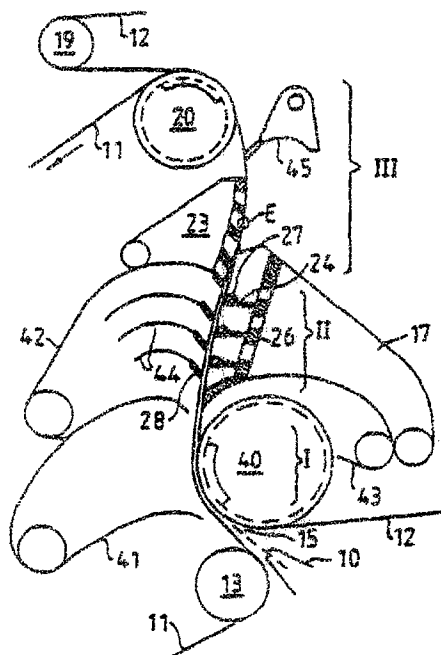
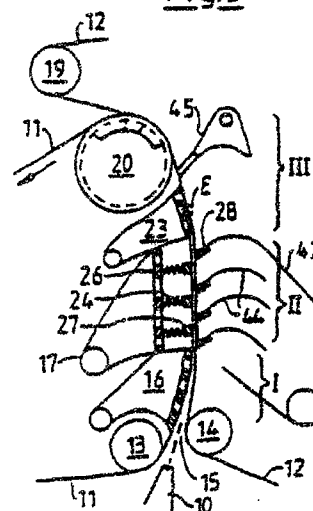


Fig.3

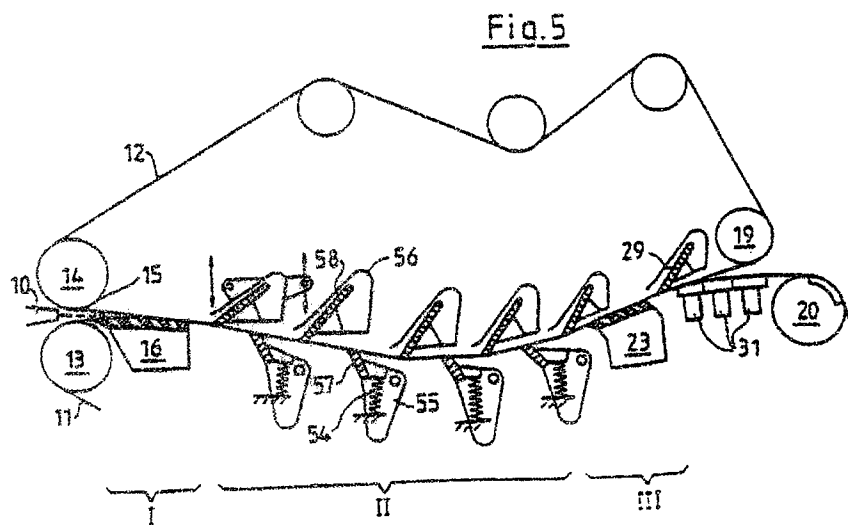
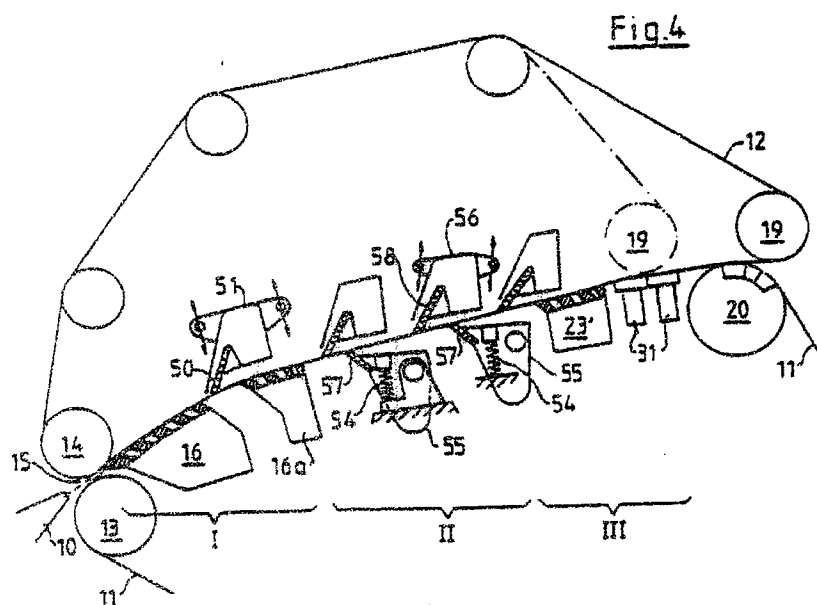


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TWIN WIRE FORMER RELATED APPLICATIONS

This is a continuing application of, and hereby incorporates by reference the entire disclosure of, application Ser. No. 09/023,435, filed Feb. 13, 1998, allowed, which is a continuing application of Ser. No. 08/556,769, filed Nov. 2, 1995, now Pat. No. 5,718,805, which is a continuing application of Ser. No. 08/286,948, filed Aug. 8, 1994, now Pat. No. 5,500,091, which is a continuing application of Ser. No. 08/055,918, filed Apr. 29, 1993, now Pat. No. 5,389,206, which is a continuing application of Ser. No. 07/773,965, filed Nov. 12, 1991, now abandoned, filed as PCT/EP90/01313 on Sept. 8, 1990, now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to a twin-wire former for the production of a fiber web, in particular a paper web, from a fiber suspension. The invention proceeds from the basis of the twin-wire former known from British Patent 1 125 906. The features indicated in the patent include a twin wire former for producing a fiber web and particularly a paper web from a fiber suspension. Two web forming wire belts, in the form of endless loops, travel together to form a twin wire zone. The web travels between and along the path of the wire belts through the twin wire zone. The twin wire zone has three sections and the elements in those three sections are described below. The patent describes features that state, in other words, that the forming of the fiber web from the pulp suspension fed from the headbox takes place exclusively between two wire belts. Thus, there is no so-called single-wire pre-drainage path. In a first section of the twin-wire zone, the two wire belts together form a wedge-shaped inlet slot; a jet of pulp slurry coming from the headbox discharges into it. The jet strikes the two wire belts at a place where they pass over a curved drainage element; in the case of the aforementioned British patent, this is a stationary, curved forming shoe. Its curved wire guide surface is formed of a plurality of strips with drainage slots between them. This forming shoe is followed (in a second section of the twin-wire zone) by a drainage strip arranged in the other wire loop and, behind the latter, by a drainage strip arranged in the first-mentioned wire loop (and formed by a first suction box). Finally, in a third section of the twin-wire zone there are a plurality of stationary drainage elements developed as flat suction boxes.

It has been attempted for decades with twin-wire formers of the known type to produce fiber webs (in particular, paper webs) of the highest possible quality with relatively high operating speeds. Due to the forming of the web between two wires, the result, in particular, is obtained that the final fiber web has substantially the same properties on both sides (little "two-sidedness"). However, it is difficult to obtain as uniform as possible a distribution of the fibers in the final fiber web. In other words, it is difficult to obtain a good "formation" since while the web is formed, there is always the danger that fibers will agglomerate and form flocculations. Therefore, it is attempted to form a jet of pulp slurry which pulp slurry is as free as possible of flocculations in the headbox (for instance, by means of a turbulence producer). It is, furthermore, endeavored so to influence the drainage of the fiber suspension during the web-forming that "reflocculation" is avoided as far as possible or that, after possible flocculation, a "deflocculation" (i.e. a breaking up of the flocculations) takes place.

It is known that a curved drainage element arranged in the first section of the twin-wire zone and, in particular, a

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stationary curved forming shoe developed in accordance with the aforementioned British Patent 1 125 906 counteracts the danger of reflocculation. This is true also of the drainage strips arranged in the British Patent in the second section of the twin-wire zone. Nevertheless, the danger of reflocculation is not completely eliminated in the arrangement according to said British Patent. Since the number of drainage strips there is very small, a large part of the web-forming takes place in the region of the following flat-suction boxes. They, to be sure, are of high drainage capacity so that the web-forming can be completed in the region of the last flat suction boxes (i.e. the so-called main drainage zone, in which a part of the fiber material is still in the form of a suspension, terminates in the region of the flat suction box). The flat suction boxes, however, are not able to avoid reflocculation or to break up flocculations which have already occurred.

In order to control these last-mentioned difficulties, a web-forming device known under the name of "Duoformer D" has been developed (TAPPI Proceedings 1988 annual meeting, pages 75 to 80). This known web-forming device is part of a twin-wire former which has a single-wire pre-drainage zone. In the twin-wire zone there are provided, in the one wire loop, a plurality of strips which are fixed in position but adjustably supported, namely, on the bottom of a suction box which drains in upward direction. Furthermore, a plurality of resiliently supported strips are provided in the other wire loop. By this resilience of the last-mentioned strips, the following result can be obtained: For example, upon an increase of the amount of suspension entering between the two wire belts, the flexibly supported strips can move away somewhat. In this way, the danger (which is present when only firmly supported strips are used) is eliminated of a backing up taking place in the fiber suspension in front of the strips. Such a backing up could destroy the fiber layers which have been formed up to then on the two wire belts. In other words, with this known web-forming device, a drainage pressure, once established, remains constant due to the resiliently supported strips even upon a change in the amount of suspension fed or upon a change in the drainage behavior of the fiber suspension. Therefore, automatic adaptation of the web-forming device to said changed conditions occurs.

With this known web-forming device, fiber webs of relatively good formation can also be formed. With respect to this, however, the demands have increased considerably recently, so that further improvements are desirable.

SUMMARY OF THE INVENTION

The object of the invention is so to develop a twin-wire of the aforementioned kind that the quality of the fiber web produced is further improved, particularly with respect to its formation (cloudiness), and that the twin-wire former can easily be adapted to different operating conditions (for instance, with regard to quantity and drainage behavior of the fiber suspension).

This object is achieved by the features set forth below in particular, there is a respective drainage strip above each of the two wire belts in the second section of the twin wire zone, and at least one of the two drainage strips is supported resiliently against the respective wire belt while the other may or may not be resiliently supported, and typically is rigidly supported against the respective wire belt. Preferably, there are at least two of the drainage strips and often more against each of the wire belts. The drainage strips against one belt are offset along the path of the wire belts with

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respect to the drainage strips against the other belt, providing a zig zag or staggered array, and the drainage strips against at least one of the belts are resiliently supported.

The inventors have found that a combination of known features, namely:

- A. Twin-wire former without a single-wire pre-drainage zone or at least without a single-wire pre-drainage zone of any substantial length such as to cause any appreciable pre-drainage
- B. Start of the drainage in the twin-wire zone at a preferably curved drainage element, for instance on a rotating forming cylinder or, even better, on a curved stationary forming shoe
- C. Further drainage in the twin-wire zone between strips which are arranged along a "zig-zag" line, the strips which rest against the one wire belt being resiliently supported, leads to an extremely high increase in the quality of the finished fiber web, so that it satisfies even the highest requirements. At the same time, the twin-wire former of the invention is insensitive to changes in the amount of suspension fed and to changes in the drainage behavior of the fiber suspension. Experiments have shown that it is possible by the invention to obtain both a high increase in quality with respect to the formation and also good values with regard to the retention of fillers and fines. In contradistinction to this, in the known double-wire formers it is constantly found that there is a strong reduction in the retention upon an improvement in the formation.

It was, furthermore, found in experiments that in the second section of the twin-wire zone the number of strips can be considerably reduced as compared with the "Duo-former D". However, this number is substantially greater than in the case of the twin-wire former known from British Patent 1 125 906. It is advantageous to increase the distance between adjacent strips as compared with the "Duo-former D". In particular, the drainage strips above each one of the wire belts are of a thickness along the path of the wire belts and the spacing between adjacent strips above each wire belt is a minimum of about three times the strip thickness.

To be sure, from German OS 31 38 133, FIG. 3, a twin-wire former is known the twin-wire zone of which is provided in a first section with a curved stationary drainage element and in a second section with strips arranged along a "zig-zag" line, which strips may also be resiliently supported and there being a relatively large distance between them. However, in that case, in front of the twin-wire zone there is a single-wire pre-drainage zone in which the forming of the web starts initially only in a lower layer of the fiber suspension fed while the upper layer remains liquid and tends very strongly to flocculation. It has been found that these flakes cannot be broken up again to the desired extent in the following twin-wire zone. Another disadvantage is that the twin-wire zone is diverted by a guide roll (14b) behind the second section. This results (due to the so-called table-roll effect) in a further drainage which is uneven over the width of the web and thus in undesired variations in the quality of the web (recognizable, for instance, by disturbing longitudinal strips).

BRIEF DESCRIPTION OF THE DRAWINGS

Other developments of the invention will be explained below with reference to embodiments which are shown in the drawing. Each of FIGS. 1 to 5 shows in simplified diagrammatic form one of the different embodiments.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The twin-wire former shown in FIG. 1 has a substantially horizontally extending twin-wire zone; this zone comprises

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three sections I, II and III arranged one behind the other. The endless wire belts (lower wire 11 and upper wire 12), shown only in part, travel in the direct vicinity of a headbox 10 over, in each case, a breast roll 13 and 14 respectively, so that the two wire belts together form a wedge-shaped entry slot 15 at the start of the twin-wire zone. The jet pulp discharged by the headbox 10 comes into contact with the two wire belts 11 and 12 only at the place where the lower wire 11 in the first section I of the twin-wire zone travels over a stationary curved forming shoe 16. The curved travel surface thereof is formed of several strips 16' with drainage slits present between them. The distance between the two breast rolls 13 and 14 is variable. The forming shoe 16 can be operated with or without vacuum. Additionally, although it is preferable that the forming shoe 16 be curved, a straight forming shoe may also be used in certain situations.

In the second section II of the twin-wire zone, the two wire belts 11 and 12 (with the partially still liquid fiber suspension present between them) travel between a lower drainage box 17 and an upper drainage box 18. In the lower drainage box 17 there are a row of at least two strips 27 (preferably of approximately rectangular cross section) which are pressed from below resiliently against the lower wire 11. For this purpose, they are supported, for instance, on springs 24 (or pneumatic pressure cushions) on a, preferably water-permeable, plate. It is obvious that the force of the springs (or of the pressure prevailing in the pressure cushions) is individually adjustable.

The upper drainage box 18 is suspended on both the front and rear ends on vertically displaceable support elements as indicated diagrammatically by double arrows. On its lower side, there is a row of at least three strips 28 of preferably parallelogram cross section which rest against the upper side of the upper wire 12 and are rigidly attached to the box 18. Above the strips 28, a front vacuum chamber 21 and a rear vacuum chamber 22 are present in the drainage box 18.

Each of the upper strips 28 scrapes off water from the wire 12. Accordingly, the amount of water scraped off decreases in the direction of flow of the wire 12 from strip to strip. The drainage water from each of the strips 28 except the drainage water scraped off by the first strip may be drained away jointly. However, it is disadvantageous to also include the drainage water from the first strip 28 since this generally would disturb the operation of the other strips. Accordingly, a vertical channel 21a is positioned in front of the first upper strip 28 to carry away or collect the water scraped off by the first strip 28.

In the region of the forming shoe 16, a part of the water of the fiber suspension is led off downward; another part penetrates due to the tension of the upper wire 12 upwards through the upper wire and is deflected by the furthest in front of the strips 28 into the front vacuum chamber 21. The water passing upward between the upper strips 28 enters into the rear vacuum chamber 22. The water penetrating between the lower strips 27 through the lower wire 11 is led off downward. Between adjacent upper drainage strips 28 there is a minimum distance X of about three times the thickness Y of the strips. The same is true of the lower resiliently supported strips 27. It is important that each of the strips 27 and 28 lies in the region of a space between two opposite strips so that a "zig-zag" arrangement (i.e. non-opposing relationship) is present. Also, as seen in FIG. 1, the first one of the strips 28 is located upstream of the first one of the strips 27. The two wires 11 and 12 preferably travel on a straight path through section II. Gentle curvature of this section of the path is, however, also possible; see FIGS. 2 and 5. Differing from FIG. 1, the resiliently supported strips

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could also be arranged in the upper box 18 and the firmly supported strips in the lower box 17. In the third section III of the twin-wire zone, both wire belts 11 and 12 travel over another preferably curved forming shoe 23 which (as shown) is arranged preferably in the lower wire loop 11. Behind it, an additional strip 29 with vacuum chamber 30 can be arranged in the loop of the upper wire 12. Furthermore, flat suction boxes 31 can be present in the loop of the lower wire. There (as is shown by dash-dot lines) the upper wire 12 can be separated by means of a guide roll 19 from the lower wire 11 and from the fiber web formed. Lower wire and fiber web then travel over a wire suction roll 20. The guide roll 19 can, however, also lie further back, so that the upper wire 12 is separated from the lower wire 11 only on the wire suction roll 20.

It is important that two drainage boxes 17 and 18 with the alternately resiliently and firmly supported ledge strips 27 and 28 lie not in the front or the rear sections but in the middle section II of the twin-wire zone, since only here can they develop their full effect, namely, intensive drainage of the fiber suspension fed while retaining the fine flocculation-free fiber distribution. This is achieved in the manner that the corresponding wire belt is imparted a slight (scarcely visible) deflection on each strip so that turbulence is constantly produced in the still liquid part of the fiber pulp. For success it is, however, also decisive that previously, in section I, a known pre-drainage towards both sides has already taken place and that this also takes place with the greatest possible retention of the flocculation-free condition of the fiber suspension.

For this two-sided pre-drainage, a stationary preferably curved forming shoe is provided in the first section I of the twin-wire zone (in accordance with FIGS. 1 and 3-5) whenever it is a question of satisfying the highest quality demands with respect to the formation. This effect of the forming shoe is due to the fact that at least the one wire belt travels polygonally from strip to strip, each strip not only leading water away but also producing turbulence in the pulp which is still liquid. With such a forming shoe, it is, however, difficult at times to obtain a stable operating condition upon the starting of the paper machine. Therefore, it may be advantageous to provide a known forming roll 40 in accordance with FIG. 2 in Section I instead of the stationary forming shoe and the breast roll lying in front of it. This possibility will be utilized when, in particular, the highest productivity is demanded from the paper manufacturing machine.

In the third section III, the aforementioned strip 29 can serve either solely to lead away water upwards or, in addition, for the further production of turbulence (for further improvement in quality). The latter is possible if a part of the fiber pulp is still in liquid condition at this place.

In FIGS. 1 to 3, the distance between the two wires 11 and 12 in the twin-wire zone has been shown greatly exaggerated. By this, it is intended to make it clear that the two wires 11 and 12 converge towards each other over a relatively long path within the twin-wire zone. This makes it clear that the process of web-forming on the first forming shoe 16 (in Section I) commences relatively slowly and is completed only in Section III. In this connection, the end of the main drainage zone in which the two wires converge towards each other (and thus, the end of the web-forming process) can lie approximately in the center of the wrapping zone of the second forming shoe 23, as is indicated, merely by way of example, in FIGS. 1 to 3. The end of the wire convergence is symbolically indicated there by the point E; the solids content of the paper web has reached there approximately

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the value of 8%. This point can, however, also lie, for instance, on one of the flat suction boxes 31. Behind this point, it is attempted further to increase the solids content, if possible even before the separation of the two wires. One goal is, namely, for the separation of the wires to take place with the highest possible solids content of the web so that as few fibers as possible are torn out of the web upon the separation. The nature and number of the drainage elements necessary for this within the twin-wire zone may, however, differ greatly and is dependent, among other things, on the type of paper and the raw-material components thereof, as well as on the operating speed.

The embodiments shown in FIGS. 2 and 3 differ from the others primarily by the fact that the twin-wire zone rises substantially vertically upward in the direction of travel of the wires. In this way, the removal of the water withdrawn from the fiber suspension is simplified since the water can be discharged relatively uniformly towards both sides. No vacuum chambers are required in particular in the central section II of the twin-wire zone. To be sure, the forming roll 40 of FIG. 2 is, as a rule, developed as a suction roll. The forming shoes 16, 23, particularly those arranged in the third section III, can, if necessary, be provided with a suction device.

Further elements of the twin-wire former shown in FIG. 2 are water-collection containers 41, 42 and 43, guide plates 44 associated with the fixed strips 28, and a water removal strip 45. The other elements are provided with the same reference numbers as the corresponding elements in FIG. 1. The same is true with regard to FIG. 3. One possible modification of FIG. 3 can consist therein that, instead of the wire suction roll 20, a forming roll is provided, and instead of the guide roll 19 the wire suction roll. A similar arrangement is known from German Utility Model 88 06 036 (Voith File: P 4539). Aside from this exception and aside from the embodiment according to FIG. 2 (with forming roll 40), the invention will, however, be used whenever possible so to design the twin-wire former that the relatively expensive forming roll (as to purchase and operation) can be dispensed with. Thus, as a rule, the wire suction roll 20 is present as the sole suction roll. Furthermore, in all embodiments of the invention it can be seen to it that no guide roll which deflects the twin-wire zone (and has the above-mentioned injurious table-roll effect) is present.

The embodiment of FIG. 4 differs from FIG. 1 among other things by the fact that, in the first section I of the twin-wire zone, a second curved stationary forming shoe 16a is arranged in the loop of the lower wire 11 behind and spaced from a first curved stationary forming shoe 16. Furthermore, in the loop of the upper wire 12 in the region between the two stationary forming shoes 16 and 16a there is provided an individual strip 50 which in known manner is part of a vacuum chamber 51. This vacuum chamber 51, similar to the upper drainage box 18 of FIG. 1, is suspended on its front and rear ends in vertically displaceable mounts. In this way, both the depth of penetration of the strip 50 into the path of travel of the upper wire 12 as well as the angle of attack of the strip 50 can be varied. With slight depth of penetration, the strip 50 serves solely for removal of water, while with greater depth of penetration it serves, in addition, for the production of turbulence in the suspension and, thus, for improvement of the formation. By the presence of two separate forming shoes 16 and 16a, the pre-drainage on both sides is temporarily interrupted; it is only continued after the strip 50 has removed from the upper wire 12 the water which has penetrated upward on the first forming shoe 16. In this way, higher operating speeds are possible.

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Another difference from FIG. 1 is that, in the second section II of the twin-wire zone, the lower, flexibly supported strips 57 and the upper, firmly supported strips 58 are developed as individual strips. This means that each strip has its own supporting body 55/56. The lower strip-supporting bodies 55 are swingably mounted, the strip 57 being pressed resiliently by the force of springs 54 against support bottom of the lower wire 11. The supporting body 56 of each of the upper strips 58 is developed as vacuum chamber in the same way as that of the strip 50. The suspension of these vacuum chambers 56 corresponds to that of the vacuum chamber 51. It is important that each of the strips 57 and 58 rest with a given force of application (corresponding to the suspension pressure) against its wire belt 11 or 12. The strips 57 and 58 are adjusted in such a manner that a slight deflection of the wire belts takes place preferably on each strip. Due to the resilient supporting of the lower strips 57, the adjustment, once effected, is insensitive to changes in the quantity or quality of pulp, so that no backing up takes place in front of the strips and, nevertheless, an effective introduction of turbulence forces into the fiber suspension takes place. In contradistinction to FIGS. 1 to 3, there is the possibility of adjusting each one of the strips 57/58 individually with respect to position in height and inclination relative to the travel path of the wire. In this way, one can even better control the quality of the paper produced, with respect to both the formation and the nature of its surface (printability). Differing from FIG. 4, the upper strips 58 could be supported resiliently and the lower strips 57 stationary. Another alternative could consist therein that not only the upper strips 58 but also the lower strips 57 are fastened in vertically displaceable mounts (as shown on the vacuum chamber 51). In such case, the springs 54 might possibly be eliminated.

Another difference between FIGS. 1 and 4 resides in the fact that in FIG. 4 the twin-wire zone rises in the direction of travel of the wires upwards with an inclination of, on the average, about 20° with respect to the horizontal. In this way, it is possible to keep the entire height of the twin-wire former relatively slight. In the third section III of the twin-wire zone, a flat forming shoe 23' is provided rather than a curved one, differing from FIG. 1. The separation of the upper wire 12 from the lower wire and the fiber web formed can take place, as in FIG. 1, on one of the flat suction boxes 31. Instead of this, however, the upper wire 12 can also be conducted up to the wire suction roll 20. There, as shown, it can wrap around a small part (or, alternatively, a larger part) of the circumference of the wire suction roll and then be returned via the reversing roll 19.

In the embodiment shown in FIG. 5, the twin-wire zone, as a whole, extends substantially in horizontal direction. The individual elements are substantially the same as in the embodiment of FIG. 4. However, there is the difference that the drainage strips 57 and 58 lying in the second section II of the twin-wire zone are arranged along a downwardly curved path of the twin-wire zone. Accordingly, an upwardly curved forming shoe 16, 23 is provided in the first section I and in the third section III of the twin-wire zone. This embodiment is advisable, in particular, for the modernizing of existing Fourdrinier paper machines.

The embodiments shown have the feature in common that, in the second section II of the twin-wire zone, there are present preferably a flexibly supported strips 27/57 and n+1 rigidly supported strips. However, it is also possible to make the number of flexibly supported strips equal to or greater by one than the number of rigidly supported strips. Instead of a rigidly supported strip, a feed or discharge edge of a drainage box can also be provided. The minimum number n

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of flexibly supported strips is two (see FIG. 4). However, three or four flexibly supported strips are preferred.

What is claimed is:

1. A method for the production of a paper web from a fiber suspension in a twin wire former comprising:

- causing first and second web forming wire belts to travel along a path together to form a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, each wire belt forming an endless loop;
 - feeding the wire belts across a single forming roll at the start of the path through the twin wire zone;
 - supporting the wire belts such as to form a wedge shaped entrance slot into the twin wire zone;
 - supplying a fiber suspension from a headbox directly to the wedge shaped entrance slot of the twin wire zone;
 - draining water from the fiber suspension by means of the forming roll in order to start the forming of the web from the fiber suspension;
 - feeding the wire belts with the fiber suspension and the web being generated therebetween downstream of the forming roll between a plurality of first drainage strips, which are positioned within the loop of the first wire belt for contacting the first wire belt, and a plurality of second drainage strips, which are positioned within the loop of the second wire belt for contacting the second wire belt, the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship;
 - resiliently supporting the first drainage strips against the first wire belt that the strips contact;
 - rigidly supporting the second drainage strips against the second wire belt;
 - feeding the wire belts with the web therebetween downstream of said drainage strips across a stationary drainage element and then across a suction roll in the twin wire zone such that as the wire belts travel over the stationary drainage element and over said suction roll, water is drained through the wire belt in contact with said stationary drainage element and with said suction roll; and
 - maintaining the twin wire zone apart from said single forming roll and said suction roll free of rolls which would deflect the twin wire zone.
2. The method of claim 1, further comprising supplying a vacuum in the area of the second drainage strips.
3. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:
- first and second web forming wire belts which travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;
 - each wire belt forming an endless loop;
 - the twin wire zone having a first section which includes a single forming roll at the start of the path of the wire belts through the twin wire zone; supports which support the wire belts for forming a wedge shaped entrance slot into the first section;
 - a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

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said single forming roll having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the wire belts through the twin wire zone, the single forming roll being engaged by one of the wire belts and being arranged for curving the path of both wire belts around the single forming roll after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the wire belts through the twin wire zone; in the second section, a plurality of the first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; a first strip support which resiliently supports the first drainage strips against the first wire belt that the first strips contact;

a second strip support which supports the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; drainage elements in the third section, for being engaged by one of the wire belts as the wire belts travel over the drainage elements, the drainage elements including at least one stationary dewatering element followed by a suction roll and having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone apart from said single forming roll and said suction roll being free of rolls which deflect the twin wire zone.

4. The twin-wire former of claim 3, further comprising a supplier of vacuum in the area of the second drainage strips.

5. A method for the production of a paper web from a fiber suspension in a twin wire former comprising:

causing first and second web forming wire belts to travel along a path together to form a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, each wire belt forming an endless loop;

feeding the wire belts across a stationary curved forming shoe at the start of the path through the twin wire zone;

supporting the wire belts such as to form a wedge shaped entrance slot into the twin wire zone;

supplying a fiber suspension from the head box directly to the wedge shaped entrance slot of the twin wire zone;

draining water from the fiber suspension by means of the forming shoe in order to start the forming of the web from the fiber suspension;

feeding the wire belts with the fiber suspension and the web being generated therebetween downstream of the forming shoe between a plurality of first drainage strips, which are positioned within the loop of the first wire belt for contacting the first wire belt, and a plurality of second drainage strips, which are positioned within the loop of the second wire belt for contacting the second wire belt, the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship;

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resiliently supporting the first drainage strips against the first wire belt that the strips contact;

rigidly supporting the second drainage strips against the second wire belt;

feeding the wire belts with the web therebetween downstream of said drainage strips across a stationary drainage element and then across a suction roll in the twin wire zone such that as the wire belts travel over the stationary drainage element and the suction roll, water is drained through the wire belt in contact with said stationary drainage element and the suction roll; and

maintaining the twin wire zone apart from said suction roll free of rolls which would deflect the twin wire zone.

6. The method of claim 5, further comprising supplying a vacuum in the area of the second drainage strips.

7. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts which travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a stationary curved forming shoe at the start of the path of the wire belts through the twin wire zone; supports which support the wire belts for forming a wedge shaped entrance slot into the first section;

a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

said stationary curved forming shoe having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the wire belts through the twin wire zone, the forming shoe being engaged by one of the wire belts and being arranged for curving the path of both wire belts around the forming shoe after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the wire belts through the twin wire zone; in the second section, a plurality of the first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belts; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; a first strip support which resiliently supports the first drainage strips against the first wire belt that the first strips contact;

a second strip support which supports the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a stationary drainage element followed by a suction roll in the third section, for being engaged by one of the wire belts as the wire belts travel over the stationary drainage element and said suction roll, the stationary drainage element and said suction

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roll having an open surface to enable water to be drained through the wire belt in contact therewith; and the twin wire zone apart from said suction roll being free of rolls which deflect the twin wire zone.

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8. The twin-wire former of claim 7, further comprising a supplier of vacuum in the area of the second drainage strips.

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TWIN WIRE FORMER548
91RELATED APPLICATIONS

This is a continuing application of, and hereby
 5 incorporates by reference the entire disclosure of, application
 Serial No. 08/286,948, filed August 8, 1994 now pending, which is
 a continuing application Serial No. 08/055,918, filed April 29,
 1993, issued February 14, 1995 as Patent 5,389,206, which is a
 continuing application Serial No. 07/773,965, filed November 12,
 10 1991, now abandoned.

BACKGROUND OF THE INVENTION

15 The present invention relates to a twin-wire former for
 the production of a fiber web, in particular a paper web, from a
 fiber suspension. The invention proceeds from the basis of the
 twin-wire former known from British Patent 1 125 906. The
 features indicated in the patent include a twin wire former for
 producing a fiber web and particularly a paper web from a fiber
 suspension. Two web forming wire belts, in the form of endless
 loops, travel together to form a twin wire zone. The web travels
 20 between and along the path of the wire belts through the twin
 wire zone. The twin wire zone has three sections and the elements
 in those three sections are described below. The patent describes
 features that state, in other words, that the forming of the
 fiber web from the pulp suspension fed from the headbox takes
 25 place exclusively between two wire belts. Thus, there is no
 so-called single-wire pre-drainage path. In a first section of
 the twin-wire zone, the two wire belts together form a
 wedge-shaped inlet slot; a jet of pulp slurry coming from the
 headbox discharges into it. The jet strikes the two wire belts at
 30 a place where they pass over a curved drainage element; in the
 case of the aforementioned British patent, this is a stationary,
 curved forming shoe. Its curved wire guide surface is formed of a
 plurality of strips with drainage slots between them. This

forming shoe is followed (in a second section of the twin-wire zone) by a drainage strip arranged in the other wire loop and, behind the latter, by a drainage strip arranged in the first-mentioned wire loop (and formed by a first suction box).
 5 Finally, in a third section of the twin-wire zone there are a plurality of stationary drainage elements developed as flat suction boxes.

It has been attempted for decades with twin-wire formers of the known type to produce fiber webs (in particular, paper webs) of the highest possible quality with relatively high
 10 operating speeds. Due to the forming of the web between two wires, the result, in particular, is obtained that the final fiber web has substantially the same properties on both sides (little "two-sidedness"). However, it is difficult to obtain as
 15 uniform as possible a distribution of the fibers in the final fiber web. In other words, it is difficult to obtain a good "formation" since while the web is formed, there is always the danger that fibers will agglomerate and form flocculations. Therefore, it is attempted to form a jet of pulp slurry which
 20 pulp slurry is as free as possible of flocculations in the headbox (for instance, by means of a turbulence producer). It is, furthermore, endeavored so to influence the drainage of the fiber suspension during the web-forming that "reflocculation" is avoided as far as possible or that, after possible flocculation,
 25 a "deflocculation" (i.e. a breaking up of the flocculations) takes place.

It is known that a curved drainage element arranged in the first section of the twin-wire zone and, in particular, a stationary curved forming shoe developed in accordance with the
 30 aforementioned British Patent 1 125 906 counteracts the danger of reflocculation. This is true also of the drainage strips arranged in the British Patent in the second section of the twin-wire zone. Nevertheless, the danger of reflocculation is not completely eliminated in the arrangement according to said
 35 British Patent. Since the number of drainage strips there is very small, a large part of the web-forming takes place in the region

of the following flat-suction boxes. They, to be sure, are of high drainage capacity so that the web-forming can be completed in the region of the last flat suction boxes (i.e. the so-called main drainage zone, in which a part of the fiber material is still in the form of a suspension, terminates in the region of the flat suction box). The flat suction boxes, however, are not able to avoid reflocculation or to break up flocculations which have already occurred.

In order to control these last-mentioned difficulties, a web-forming device known under the name of "Duoformer D" has been developed (TAPPI Proceedings 1988 annual meeting, pages 75 to 80). This known web-forming device is part of a twin-wire former which has a single-wire pre-drainage zone. In the twin-wire zone there are provided, in the one wire loop, a plurality of strips which are fixed in position but adjustably supported, namely, on the bottom of a suction box which drains in upward direction. Furthermore, a plurality of resiliently supported strips are provided in the other wire loop. By this resilience of the last-mentioned strips, the following result can be obtained: For example, upon an increase of the amount of suspension entering between the two wire belts, the flexibly supported strips can move away somewhat. In this way, the danger (which is present when only firmly supported strips are used) is eliminated of a backing up taking place in the fiber suspension in front of the strips. Such a backing up could destroy the fiber layers which have been formed up to then on the two wire belts. In other words, with this known web-forming device, a drainage pressure, once established, remains constant due to the resiliently supported strips even upon a change in the amount of suspension fed or upon a change in the drainage behavior of the fiber suspension. Therefore, automatic adaptation of the web-forming device to said changed conditions occurs.

With this known web-forming device, fiber webs of relatively good formation can also be formed. With respect to this, however, the demands have increased considerably recently, so that further improvements are desirable.

SUMMARY OF THE INVENTION

The object of the invention is so to develop a twin-wire of the aforementioned kind that the quality of the fiber web produced is further improved, particularly with respect to its formation (cloudiness), and that the twin-wire former can easily be adapted to different operating conditions (for instance, with regard to quantity and drainage behavior of the fiber suspension).

This object is achieved by the features set forth below. In particular, there is a respective drainage strip above each of the two wire belts in the second section of the twin wire zone, and at least one of the two drainage strips is supported resiliently against the respective wire belt while the other may or may not be resiliently supported, and typically is rigidly supported against the respective wire belt. Preferably, there are at least two of the drainage strips and often more against each of the wire belts. The drainage strips against one belt are offset along the path of the wire belts with respect to the drainage strips against the other belt, providing a zig zag or staggered array, and the drainage strips against at least one of the belts are resiliently supported.

The inventors have found that a combination of known features, namely:

- A. Twin-wire former without a single-wire pre-drainage zone or at least without a single-wire pre-drainage zone of any substantial length such as to cause any appreciable pre-drainage
- B. Start of the drainage in the twin-wire zone at a preferably curved drainage element, for instance on a rotating forming cylinder or, even better, on a curved stationary forming shoe
- C. Further drainage in the twin-wire zone between strips which are arranged along a "zig-zag" line, the strips which rest against the one wire belt being resiliently supported,

leads to an extremely high increase in the quality of the finished fiber web, so that it satisfies even the highest requirements. At the same time, the twin-wire former of the invention is insensitive to changes in the amount of suspension fed and to changes in the drainage behavior of the fiber suspension. Experiments have shown that it is possible by the invention to obtain both a high increase in quality with respect to the formation and also good values with regard to the retention of fillers and fines. In contradistinction to this, in the known double-wire formers it is constantly found that there is a strong reduction in the retention upon an improvement in the formation.

It was, furthermore, found in experiments that in the second section of the twin-wire zone the number of strips can be considerably reduced as compared with the "Duoformer D". However, this number is substantially greater than in the case of the twin-wire former known from British Patent 1 125 906. It is advantageous to increase the distance between adjacent strips as compared with the "Duoformer D". In particular, the drainage strips above each one of the wire belts are of a thickness along the path of the wire belts and the spacing between adjacent strips above each wire belt is a minimum of about three times the strip thickness.

To be sure, from German OS 31 38 133, FIG. 3, a twin-wire former is known the twin-wire zone of which is provided in a first section with a curved stationary drainage element and in a second section with strips arranged along a "zig-zag" line, which strips may also be resiliently supported and there being a relatively large distance between them. However, in that case, in front of the twin-wire zone there is a single-wire pre-drainage zone in which the forming of the web starts initially only in a lower layer of the fiber suspension fed while the upper layer remains liquid and tends very strongly to flocculation. It has been found that these flakes cannot be broken up again to the desired extent in the following twin-wire zone. Another disadvantage is that the twin-wire zone is diverted by a guide

roll (14b) behind the second section. This results (due to the so-called table-roll effect) in a further drainage which is uneven over the width of the web and thus in undesired variations in the quality of the web (recognizable, for instance, by disturbing longitudinal stripes).

BRIEF DESCRIPTION OF THE DRAWINGS

Other developments of the invention will be explained below with reference to embodiments which are shown in the drawing. Each of FIGS. 1 to 5 shows in simplified diagrammatic form one of the different embodiments.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The twin-wire former shown in FIG. 1 has a substantially horizontally extending twin-wire zone; this zone comprises three sections I, II and III arranged one behind the other. The endless wire belts (lower wire 11 and upper wire 12), shown only in part, travel in the direct vicinity of a headbox 10 over, in each case, a breast roll 13 and 14 respectively, so that the two wire belts together form a wedge-shaped entry slot 15 at the start of the twin-wire zone. The jet pulp discharged by the headbox 10 comes into contact with the two wire belts 11 and 12 only at the place where the lower wire 11 in the first section I of the twin-wire zone travels over a stationary curved forming shoe 16. The curved travel surface thereof is formed of several strips 16' with drainage slits present between them. The distance between the two breast rolls 13 and 14 is variable. The forming shoe 16 can be operated with or without vacuum. Additionally, although it is preferable that the forming shoe 16 be curved, a straight forming shoe may also be used in certain situations.

In the second section II of the twin-wire zone, the two wire belts 11 and 12 (with the partially still liquid fiber suspension present between them) travel between a lower drainage box 17 and an upper drainage box 18. In the lower drainage box 17 there are a row of at least two strips 27 (preferably of approximately rectangular cross section) which are pressed from

below resiliently against the lower wire 11. For this purpose, they are supported, for instance, on springs 24 (or pneumatic pressure cushions) on a, preferably water-permeable, plate. It is obvious that the force of the springs (or of the pressure prevailing in the pressure cushions) is individually adjustable.

The upper drainage box 18 is suspended on both the front and rear ends on vertically displaceable support elements as indicated diagrammatically by double arrows. On its lower side, there is a row of at least three strips 28 of preferably parallelogram cross section which rest against the upper side of the upper wire 12 and are rigidly attached to the box 18. Above the strips 28, a front vacuum chamber 21 and a rear vacuum chamber 22 are present in the drainage box 18.

Each of the upper strips 28 scrapes off water from the wire 12. Accordingly, the amount of water scraped off decreases in the direction of flow of the wire 12 from strip to strip. The drainage water from each of the strips 28 except the drainage water scraped off by the first strip may be drained away jointly. However, it is disadvantageous to also include the drainage water from the first strip 28 since this generally would disturb the operation of the other strips. Accordingly, a vertical channel 21a is positioned in front of the first upper strip 28 to carry away or collect the water scraped off by the first strip 28.

In the region of the forming shoe 16, a part of the water of the fiber suspension is led off downward; another part penetrates due to the tension of the upper wire 12-upwards through the upper wire and is deflected by the furthest in front of the strips 28 into the front vacuum chamber 21. The water passing upward between the upper strips 28 enters into the rear vacuum chamber 22. The water penetrating between the lower strips 27 through the lower wire 11 is led off downward. Between adjacent upper drainage strips 28 there is a minimum distance X of about three times the thickness Y of the strips. The same is true of the lower resiliently supported strips 27. It is important that each of the strips 27 and 28 lies in the region of a space between two opposite strips so that a "zig-zag"

arrangement (i.e. non-opposing relationship) is present. Also, as seen in FIG. 1, the first one of the strips 28 is located upstream of the first one of the strips 27. The two wires 11 and 12 preferably travel on a straight path through section II.

Gentle curvature of this section of the path is, however, also possible; see FIGS. 2 and 5. Differing from FIG. 1, the resiliently supported strips could also be arranged in the upper box 18 and the firmly supported strips in the lower box 17. In the third section III of the twin-wire zone, both wire belts 11 and 12 travel over another preferably curved forming shoe 23 which (as shown) is arranged preferably in the lower wire loop 11. Behind it, an additional strip 29 with vacuum chamber 30 can be arranged in the loop of the upper wire 12. Furthermore, flat suction boxes 31 can be present in the loop of the lower wire. There (as is shown by dash-dot lines) the upper wire 12 can be separated by means of a guide roll 19 from the lower wire 11 and from the fiber web formed. Lower wire and fiber web then travel over a wire suction roll 20. The guide roll 19 can, however, also lie further back, so that the upper wire 12 is separated from the lower wire 11 only on the wire suction roll 20.

It is important that two drainage boxes 17 and 18 with the alternately resiliently and firmly supported ledge strips 27 and 28 lie not in the front or the rear sections but in the middle section II of the twin-wire zone, since only here can they develop their full effect, namely, intensive drainage of the fiber suspension fed while retaining the fine flocculation-free fiber distribution. This is achieved in the manner that the corresponding wire belt is imparted a slight (scarcely visible) deflection on each strip so that turbulence is constantly produced in the still liquid part of the fiber pulp. For success it is, however, also decisive that previously, in section I, a known pre-drainage towards both sides has already taken place and that this also takes place with the greatest possible retention of the flocculation-free condition of the fiber suspension.

For this two-sided pre-drainage, a stationary preferably curved forming shoe is provided in the first section I

of the twin-wire zone (in accordance with FIGS. 1 and 3-5) whenever it is a question of satisfying the highest quality demands with respect to the formation. This effect of the forming shoe is due to the fact that at least the one wire belt travels polygonally from strip to strip, each strip not only leading water away but also producing turbulence in the pulp which is still liquid. With such a forming shoe, it is, however, difficult at times to obtain a stable operating condition upon the starting of the paper machine. Therefore, it may be advantageous to provide a known forming roll 40 in accordance with FIG. 2 in Section I instead of the stationary forming shoe and the breast roll lying in front of it. This possibility will be utilized when, in particular, the highest productivity is demanded from the paper manufacturing machine.

In the third section III, the aforementioned strip 29 can serve either solely to lead away water upwards or, in addition, for the further production of turbulence (for further improvement in quality). The latter is possible if a part of the fiber pulp is still in liquid condition at this place.

In FIGS. 1 to 3, the distance between the two wires 11 and 12 in the twin-wire zone has been shown greatly exaggerated. By this, it is intended to make it clear that the two wires 11 and 12 converge towards each other over a relatively long path within the twin-wire zone. This makes it clear that the process of web-forming on the first forming shoe 16 (in Section I) commences relatively slowly and is completed only in Section III. In this connection, the end of the main drainage zone in which the two wires converge towards each other (and thus, the end of the web-forming process) can lie approximately in the center of the wrapping zone of the second forming shoe 23, as is indicated, merely by way of example, in FIGS. 1 to 3. The end of the wire convergence is symbolically indicated there by the point E; the solids content of the paper web has reached there approximately the value of 8%. This point can, however, also lie, for instance, on one of the flat suction boxes 31. Behind this point, it is attempted further to increase the solids content, if possible

even before the separation of the two wires. One goal is, namely, for the separation of the wires to take place with the highest possible solids content of the web so that as few fibers as possible are torn out of the web upon the separation. The nature and number of the drainage elements necessary for this within the twin-wire zone may, however, differ greatly and is dependent, among other things, on the type of paper and the raw-material components thereof, as well as on the operating speed.

The embodiments shown in FIGS. 2 and 3 differ from the others primarily by the fact that the twin-wire zone rises substantially vertically upward in the direction of travel of the wires. In this way, the removal of the water withdrawn from the fiber suspension is simplified since the water can be discharged relatively uniformly towards both sides. No vacuum chambers are required in particular in the central section II of the twin-wire zone. To be sure, the forming roll 40 of FIG. 2 is, as a rule, developed as a suction roll. The forming shoes 16, 23, particularly those arranged in the third section III, can, if necessary, be provided with a suction device.

Further elements of the twin-wire former shown in FIG. 2 are water-collection containers 41, 42 and 43, guide plates 44 associated with the fixed strips 28, and a water removal strip 45. The other elements are provided with the same reference numbers as the corresponding elements in FIG. 1. The same is true with regard to FIG. 3. One possible modification of FIG. 3 can consist therein that, instead of the wire suction roll 20, a forming roll is provided, and instead of the guide roll 19 the wire suction roll. A similar arrangement is known from German Utility Model 88 06 036 (Voith File: P 4539). Aside from this exception and aside from the embodiment according to FIG. 2 (with forming roll 40), the invention will, however, be used whenever possible-so to design the twin-wire former that the relatively expensive forming roll (as to purchase and operation) can be dispensed with. Thus, as a rule, the wire suction roll 20 is present as the sole suction roll. Furthermore, in all embodiments of the invention it can be seen to it that no guide roll which

deflects the twin-wire zone (and has the above-mentioned injurious table-roll effect) is present.

The embodiment of FIG. 4 differs from FIG. 1 among other things by the fact that, in the first section I of the twin-wire zone, a second curved stationary forming shoe 16a is arranged in the loop of the lower wire 11 behind and spaced from a first curved stationary forming shoe 16. Furthermore, in the loop of the upper wire 12 in the region between the two stationary forming shoes 16 and 16a there is provided an individual strip 50 which in known manner is part of a vacuum chamber 51. This vacuum chamber 51, similar to the upper drainage box 18 of FIG. 1, is suspended on its front and rear ends in vertically displaceable mounts. In this way, both the depth of penetration of the strip 50 into the path of travel of the upper wire 12 as well as the angle of attack of the strip 50 can be varied. With slight depth of penetration, the strip 50 serves solely for removal of water, while with greater depth of penetration it serves, in addition, for the production of turbulence in the suspension and, thus, for improvement of the formation. By the presence of two separate forming shoes 16 and 16a, the pre-drainage on both sides is temporarily interrupted; it is only continued after the strip 50 has removed from the upper wire 12 the water which has penetrated upward on the first forming shoe 16. In this way, higher operating speeds are possible.

Another difference from FIG. 1 is that, in the second section II of the twin-wire zone, the lower, flexibly supported strips 57 and the upper, firmly supported strips 58 are developed as individual strips. This means that each strip has its own supporting body 55/56. The lower strip-supporting bodies 55 are swingably mounted, the strip 57 being pressed resiliently by the force of springs 54 against the bottom of the lower wire 11. The supporting body 56 of each of the upper strips 58 is developed as vacuum chamber in the same way as that of the strip 50. The suspension of these vacuum chambers 56 corresponds to that of the vacuum chamber 51. It is important that each of the strips 57 and

58 rest with a given force of application (corresponding to the suspension pressure) against its wire belt 11 or 12. The strips 57 and 58 are adjusted in such a manner that a slight deflection of the wire belts takes place preferably on each strip. Due to the resilient supporting of the lower strips 57, the adjustment, once effected, is insensitive to changes in the quantity or quality of pulp, so that no backing up takes place in front of the strips and, nevertheless, an effective introduction of turbulence forces into the fiber suspension takes place. In contradistinction to FIGS. 1 to 3, there is the possibility of adjusting each one of the strips 57/58 individually with respect to position in height and inclination relative to the travel path of the wire. In this way, one can even better control the quality of the paper produced, with respect to both the formation and the nature of its surface (printability). Differing from FIG. 4, the upper strips 58 could be supported resiliently and the lower strips 57 stationary. Another alternative could consist therein that not only the upper strips 58 but also the lower strips 57 are fastened in vertically displaceable mounts (as shown on the vacuum chamber 51). In such case, the springs 54 might possibly be eliminated.

Another difference between FIGS. 1 and 4 resides in the fact that in FIG. 4 the twin-wire zone rises in the direction of travel of the wires upwards with an inclination of, on the average, about 20° with respect to the horizontal. In this way, it is possible to keep the entire height of the twin-wire former relatively slight. In the third section III of the twin-wire zone, a flat forming shoe 23' is provided rather than a curved one, differing from FIG. 1. The separation of the upper wire 12 from the lower wire and the fiber web formed can take place, as in FIG. 1, on one of the flat suction boxes 31. Instead of this, however, the upper wire 12 can also be conducted up to the wire suction roll 20. There, as shown, it can wrap around a small part (or, alternatively, a larger part) of the circumference of the wire suction roll and then be returned via the reversing roll 19.

In the embodiment shown in FIG. 5, the twin-wire zone,

as a whole, extends substantially in horizontal direction. The individual elements are substantially the same as in the embodiment of FIG. 4. However, there is the difference that the drainage strips 57 and 58 lying in the second section II of the twin-wire zone are arranged along a downwardly curved path of the twin-wire zone. Accordingly, an upwardly curved forming shoe 16, 23 is provided in the first section I and in the third section III of the twin-wire zone. This embodiment is advisable, in particular, for the modernizing of existing Fourdrinier paper machines.

The embodiments shown have the feature in common that, in the second section II of the twin-wire zone, there are present preferably n flexibly supported strips 27/57 and $n + 1$ rigidly supported strips. However, it is also possible to make the number of flexibly supported strips equal to or greater by one than the number of rigidly supported strips. Instead of a rigidly supported strip, a feed or discharge edge of a drainage box can also be provided. The minimum number n of flexibly supported strips is two (see FIG. 4). However, three or four flexibly supported strips are preferred.

CLAIMS

What is claimed is:

1. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone of a substantial length;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that strip contacts;

second support means supporting the second drainage strips rigidly against the second wire belt;

first means for collecting the water drained from the fiber suspension by the most upstream one of the drainage strips;

35 second means separate from the first means for
collecting the water drained from the fiber suspension by all of
the other drainage strips; and
the twin wire zone having a third section following the
second section along the path of the wire belts through the twin
wire zone; a second drainage element in the third section for
40 being engaged by one of the wire belts as the wire belts travel
over the second drainage element.

2. The twin wire former of claim 1, wherein the first
drainage element is stationary.

45 3. The twin wire former of claim 2, wherein the first
drainage element is curved and is engaged by one of the wire
belts for curving the path of the belts around the curved
drainage element after the entrance of the suspension into the
entrance slot.

4. The twin wire former of claim 3, wherein the first
drainage element has an open surface to enable drainage of water
from the fiber suspension.

5. The twin wire former of claim 1, wherein the twin
wire zone is free of rolls which deflect the twin wire zone.

6. The twin wire former of claim 1, wherein the twin
wire zone is free of any forming rolls.

7. The twin wire former of claim 1, wherein the first
drainage strips are located within the same wire belt loop as the
first drainage element and the second drainage strips are located
within the other wire belt group.

8. The twin wire former of claim 7, wherein the first
one of the second drainage strips is located upstream of the
first one of the first drainage strips and the last one of the

second drainage strips is located downstream of the last one of the first drainage strips.

9. The twin wire former of claim 1, further comprising means for supplying a vacuum in the area of the second drainage strips.

10. The twin wire former of claim 1, wherein each of the drainage strips has a respective "thickness in the direction along the path through the twin wire zone; neighboring ones of the first drainage strips are spaced a minimum distance of about three times the respective first strip thickness, and neighboring ones of the second drainage strips are also spaced a minimum distance of about three times the respective second strip thickness.

11. The twin wire former of claim 1, wherein the support means for the second drainage strips include means enabling adjustment of the position of the second drainage strips relative to the second wire belt to set the initial rigid position thereof.

12. The twin wire former of claim 11, wherein the support means for the second drainage strips comprise a support body to which the second drainage strips are supported, and bearings on which the support body is supported for enabling displacement of the support body across the path of the wire belts through the second section.

13. The twin wire former of claim 1, wherein the first and second support means comprise a respective individual support body supporting each of at least one of the first and second drainage strips individually, and means supporting the respective support body for each strip to be displaceable for enabling displacement of the respective strip transverse to the direction of the path of the wire belts.

14. The twin wire former of claim 1, wherein the first and second support means comprise a respective individual support body supporting each of the first and second drainage strips individually and means further supporting the respective support body of at least one of the first and second strips for enabling said at least one strip to be moved transverse to the direction of the path of the wire belts.

15. The twin wire former of claim 1, further comprising a curved stationary forming shoe in the first section of the twin wire zone and following after and spaced from the curved drainage element along the path of the wire belts through the first section;

a first section strip disposed at the second wire belt and in the space between the curved drainage element and the curved stationary forming shoe in the first section of the twin wire zone along the path of the wire belts through the twin wire zone for enabling removal of water from the second wire belt.

16. The twin wire former of claim 1, wherein the second drainage element in the third section of the twin wire zone is stationary.

17. The twin wire former of claim 16, wherein the second drainage element is curved.

18. The twin wire former of claim 17, wherein the second drainage element has a curvature that is curved in the same direction as the curvature of the curved drainage element in the first section of the twin wire zone.

19. The twin wire former of claim 18, further comprising an additional strip in the third section of the twin wire zone following the second drainage element and disposed against the other wire belt than the stationary drainage element.

20. The twin wire former of claim 18, wherein the first drainage element in the first section of the twin wire zone and the second drainage element in the third section of the twin wire zone are arranged against the same one of the first and second wire belts.

21. The twin wire former of claim 1, further comprising a suction roll at one of the wire belts and located after the first drainage element along the path of the wire belts; both of the wire belts being wrapped about part of the circumference of the suction roll.

22. The twin wire former of claim 1, wherein the means for directing the wire belts are positioned so that the twin wire zone rises substantially vertically upwardly in the path of travel of the wire belts through the twin wire zone.

23. The twin wire former of claim 1, wherein the means for directing the wire belts are positioned so that the twin wire zone rises gradually upwardly along the path of travel of the wire belts through the twin wire zone at an incline with respect to the horizontal in the range of about 10° to 30°.

24. The twin wire former of claim 1, wherein the first and the second drainage strips in the second section of the twin wire zone are both arranged one after the other along the path of the wire belts through the twin wire zone so as to define a curvature for the path of the wire belts through the second section.

25. The twin wire former of claim 14, wherein the first and second drainage strips are positioned in the second section of the twin wire zone to define a curvature for the path of the wire belts through the second section of the twin wire zone that is opposite the curvature of the curved drainage element in the first section of the twin wire zone.

26. The twin wire former of claim 1, wherein the means for directing the wire belts are positioned so that the twin wire zone extends substantially horizontally;

the first drainage element in the first section of the twin wire zone being generally curved upwardly for giving the path of the wire belts through the first section of the twin wire zone a generally upward curve; the first and second drainage strips in the second section of the twin wire zone being so positioned as to give the wire belts a generally downward curvature through at least part of the second section of the twin wire zone and the stationary drainage element in the third section of the twin wire zone is curved in a direction to give the wire belts passing through the third section of the twin wire zone a generally upward curvature.

27. The twin wire former of claim 1, wherein the stationary drainage element is curved.

28. The twin wire former of claim 1, wherein the stationary drainage element includes means for providing suction thereto to facilitate drainage of water.

29. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone of a substantial length;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and

15 directed for delivering fiber suspension from the headbox to the
wedge shaped entrance slot of the first section of the twin wire
zone.

the twin wire zone having a second section following
the first section along the path of the belts through the twin
20 wire zone; in the second section, a plurality of first drainage
strips are positioned within the loop of the first wire belt and
are for contacting the first wire belt; in the second section, a
plurality of second drainage strips are positioned within the
loop of the second wire belt and are for contacting the second
25 wire belt; the first strips being shifted in position along the
path of the wire belts with respect to the second strips so that
the first and second strips are offset and in a non-opposing
relationship; first support means for resiliently supporting the
first drainage strips against the respective wire belt that strip
30 contacts, the last one of the second drainage strips being
located downstream of the last one of the first drainage strips;

second support means supporting the second drainage
strips rigidly against the second wire belt;

the twin wire zone having a third section following the
35 second section along the path of the wire belts through the twin
wire zone; a drainage element in the third section for being
engaged by one of the wire belts as the wire belts travel over
the drainage element, the drainage element having an open surface
to enable water to be drained through the wire belt in contact
40 therewith; and

the twin wire zone being free of rolls which deflect
the twin wire zone.

30. A twin-wire former for the production of a paper
web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for
directing the wire belts to travel along a path together for
5 forming a twin wire zone of the twin wire former, with the web
between the wire belts as the wire belts travel along the path

through the twin wire zone, neither wire belt defining a single wire predrainage zone of a substantial length;

each wire belt forming an endless loop;

10 the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and
15 directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that strip contacts, the last one of the second drainage strips being
20 located downstream of the last one of the first drainage strips;

second support means supporting the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the
35 second section along the path of the wire belts through the twin wire zone; a drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the stationary drainage element; and

the twin wire zone being free of any forming rolls.

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P/14-363

ABSTRACT OF THE DISCLOSURE

In a twin-wire former for the production of a paper web, two wire belts (11 and 12) together form a twin-wire zone which is divided into three sections (I, II and III). In the first section (I) the two wires (11, 12) travel over a curved forming shoe (16). They form there a wedge-shaped inlet slot (15) with which a headbox (10) is directly associated. In the second section (II), several resiliently supported strips (27) rest against the lower wire (11) and between each of said strips (27) a rigidly mounted strip (28) rests against the upper wire (12). In the third section (III) both wire belts (11, 12) pass over another curved forming shoe (23).

0916138.022636

P/14-385

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Rudolf BUCK et al.

Date: September 25, 1998

Serial No.:

Group Art Unit:

Filed: Herewith

Examiner:

For: TWIN WIRE FORMER

AMENDMENT TRANSMITTAL LETTER - FEE COMPUTATIONHon. Commissioner of Patents and Trademarks
Washington, D.C. 20231

Transmitted herewith is an amendment in the above-identified application.

"Small Entity" status (37 C.F.R. §1.9 & §1.27) established previously by enclosed verified statement.

OPGS Check No. 79704, which includes the fee of \$82.00 calculated below, is attached.

NO. CLAIMS AFTER AMENDMENT	HIGHEST NO. PREVIOUSLY PAID FOR	EXTRA PRESENT	RATE	ADDIT. FEE
TOTAL 8	MINUS 20	* = 0	x (\$11 SE or \$22)	\$ 0
INDEP. 4	MINUS 3	** = 1	x (\$41 SE or \$82)	\$ 82
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				x (\$135 SE or \$270)
* not less than 20 ** not less than 3				TOTAL \$ 82

In the event the actual fee is greater than the payment submitted or is inadvertently not enclosed or if any additional fee during the prosecution of this application is not paid, the Patent Office is authorized to charge the underpayment to Deposit Account No. 15-0700.

If this communication is filed after the shortened statutory time period had elapsed and no separate Petition is enclosed, the Commissioner of Patents and Trademarks is petitioned, under 37 C.F.R. §1.136(a), to extend the time for filing a response to the outstanding Office Action by the number of months which will avoid abandonment under 37 C.F.R. §1.135. The fee under 37 C.F.R. § 1.17 should be charged to our Deposit Account No. 15-0700.

EXPRESS MAIL CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail Post Office to Addressee (mail label #TB83212172X) in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on September 25, 1998:

DOROTHY JENKINS

Name of Person Mailing Correspondence

Dorothy Jenkins

Signature

September 25, 1998

Date of Signature

MP:rk

Respectfully submitted,

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UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR CONTINUING APPLICATION			CFGS FILE NO. P/14-363																		
<p>As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name; that I verify believe that I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:</p> <p style="text-align: center;">TWIN WIRE FORMER</p>																					
<p>the specification of which</p> <p><input type="checkbox"/> is attached hereto.</p>																					
<p><input checked="" type="checkbox"/> was filed on <u>11/02/95</u> as United States Patent Application Serial No. <u>08/556,769</u></p> <p><input type="checkbox"/> was filed on _____ as PCT international application No. _____</p> <p>and was amended on <u>02/07/96</u> (if any).</p>																					
<p>I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by the amendments referred to above.</p> <p>I acknowledge my duty to disclose all information known to be material to patentability, pursuant to Title 37, Code of the Federal Regulations, §1.56.</p> <p>I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:</p>																					
Prior Foreign Application(s)																					
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119																		
Germany	P 39 27 597.3	08/22/89	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No																		
			<input type="checkbox"/> Yes <input type="checkbox"/> No																		
			<input type="checkbox"/> Yes <input type="checkbox"/> No																		
<p>I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">07/773,965</td> <td style="width: 30%;">November 12, 1991</td> <td style="width: 40%;">Abandoned</td> </tr> <tr> <td>(Application Serial No.)</td> <td>(Filing Date)</td> <td>(Status)</td> </tr> <tr> <td>08/286,948</td> <td>August 8, 1994</td> <td>Pending</td> </tr> <tr> <td>(Application Serial No.)</td> <td>(Filing Date)</td> <td>(Status)</td> </tr> <tr> <td>08/055,918</td> <td>April 29, 1993</td> <td>Issued</td> </tr> <tr> <td>(Application Serial No.)</td> <td>(Filing Date)</td> <td>(Status)</td> </tr> </table> <p>As to the application under which I claim benefit under Title 35, United States Code, §120, I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:</p>				07/773,965	November 12, 1991	Abandoned	(Application Serial No.)	(Filing Date)	(Status)	08/286,948	August 8, 1994	Pending	(Application Serial No.)	(Filing Date)	(Status)	08/055,918	April 29, 1993	Issued	(Application Serial No.)	(Filing Date)	(Status)
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Prior Foreign Application(s)																					
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119																		
Germany	P 39 27 597.3	08/22/89	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No																		
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UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR CONTINUING APPLICATION			OPGS FILE NO. P/14-363																
<p>As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name; that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:</p> <p style="text-align: center;">TWIN WALKER FORMER</p>																			
<p>the specification of which</p> <p><input type="checkbox"/> is attached hereto.</p> <p><input checked="" type="checkbox"/> was filed on <u>11/02/95</u> as United States Patent Application Serial No. <u>08/556,769</u></p> <p><input type="checkbox"/> was filed on _____ as PCT International application No. _____</p> <p>and was intended on <u>02/07/96</u> (if any).</p> <p>I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by the amendments referred to above.</p> <p>I acknowledge my duty to disclose all information known to be material to patentability, pursuant to Title 37, Code of Federal Regulations, §1.56.</p> <p>I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:</p>																			
<p>Prior Foreign Application(s)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">COUNTRY</th> <th style="width: 30%;">APPLICATION NUMBER</th> <th style="width: 25%;">DATE OF FILING (day, month, year)</th> <th style="width: 20%;">PRIORITY CLAIMED UNDER 35 U.S.C. 119</th> </tr> </thead> <tbody> <tr> <td>Germany</td> <td>P 39 27 597.3</td> <td>08/22/89</td> <td><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> <tr> <td></td> <td></td> <td></td> <td><input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> <tr> <td></td> <td></td> <td></td> <td><input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> </tbody> </table>				COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119	Germany	P 39 27 597.3	08/22/89	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				<input type="checkbox"/> Yes <input type="checkbox"/> No				<input type="checkbox"/> Yes <input type="checkbox"/> No
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119																
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			<input type="checkbox"/> Yes <input type="checkbox"/> No																
			<input type="checkbox"/> Yes <input type="checkbox"/> No																
<p>I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">(Application Serial No.)</th> <th style="width: 30%;">(Filing Date)</th> <th style="width: 40%;">(Status)</th> </tr> </thead> <tbody> <tr> <td>07/773,965</td> <td>November 12, 1991</td> <td>Abandoned</td> </tr> <tr> <td>08/286,948</td> <td>AUGUST 3, 1994</td> <td>Pending</td> </tr> <tr> <td>08/055,918</td> <td>April 29, 1993</td> <td>Issued</td> </tr> </tbody> </table> <p>As to the application under which I claim benefit under Title 35, United States Code, §120, I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:</p>				(Application Serial No.)	(Filing Date)	(Status)	07/773,965	November 12, 1991	Abandoned	08/286,948	AUGUST 3, 1994	Pending	08/055,918	April 29, 1993	Issued				
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			<input type="checkbox"/> Yes <input type="checkbox"/> No																
			<input type="checkbox"/> Yes <input type="checkbox"/> No																

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OPGS FORM DE1 (392)

PAGE 2

UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR CONTINUING APPLICATION		OFCS FILE NO. P/14-363
<p>I hereby appoint OSTROLENK, FABER, GERB & SOFFEN and the members of the Firm, Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Berliner—Reg. No. 18,853; Robert C. Faber—Reg. No. 21,322; Edward A. Meilman—Reg. No. 24,735; Stanley M. Lieherstein—Reg. No. 22,400; Steven L. Weinburg—Reg. No. 27,409; Max Moskowitz—Reg. No. 30,576; Stephen A. Soffen—Reg. No. 31,063; and James A. Finder—Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.</p> <p>SEND CORRESPONDENCE TO:</p> <p style="text-align: center;">OSTROLENK, FABER, GERB & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NEW YORK 10036-8403 DIRECT TELEPHONE CALLS TO: (212) 382-0700</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>		
Full name of Sole or First Inventor Dieter Egelhof	Inventor's Signature	Date
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Lucas-Cranach-Str. 15, D-7920 Heidenheim, Germany		
Full name of Second Joint Inventor Klaus Henseler	Inventor's Signature	Date
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Wildstr. 20, D-7920 Heidenheim, Germany		
Full name of Third Joint Inventor Werner Kade	Inventor's Signature	Date 8/5/20/96
Residence Neenah, Wisconsin 54956	Country of Citizenship Germany	
Post Office Address 521 Harbor Light Court, Neenah, Wisconsin 54956, USA		
Full name of Fourth Joint Inventor Albrecht Meinecke	Inventor's Signature	Date
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Hans-Holheim-Str. 39, D-7920 Heidenheim, Germany		
Full name of Fifth Joint Inventor Wilhelm Wanka	Inventor's Signature	Date
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Donauschwabenstr. 47, D-7920 Heidenheim, Germany		

OFCS FORM DE1 (79)

CONTINUED ON PAGE 3

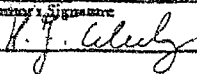
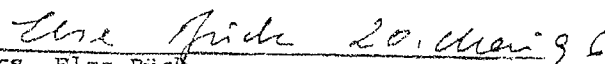
PAGE 4

UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR CONTINUING APPLICATION		OPGS FILE NO. P/14-363
<p>I hereby appoint OSTROLENK, FABER, GERB & SOFFEN and the members of the Firm, Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Berliner—Reg. No. 18,653; Robert C. Faber—Reg. No. 24,322; Edward A. Meilman—Reg. No. 24,735; Stanley H. Lieberstein—Reg. No. 22,400; Steven L. Weisburd—Reg. No. 27,409; Max Moskowitz—Reg. No. 30,578; Stephen A. Soffen—Reg. No. 31,063; and James A. Finner—Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.</p> <p>SEND CORRESPONDENCE TO: OSTROLENK, FABER, GERB & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NEW YORK 10036-8403 DIRECT TELEPHONE CALLS TO: (212) 382-0700</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>		
Full name of Sole or First Inventor Dieter Egelhof	Inventor's Signature <i>Dieter Egelhof</i>	Date MAY 22, 1996
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Lucas-Cranach-Str. 15, D-7920 Heidenheim, Germany		
Full name of Second Joint Inventor Klaus Henseler	Inventor's Signature <i>Klaus Henseler</i>	Date 24.05.96
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Wildstr. 20, D-7920 Heidenheim, Germany		
Full name of Third Joint Inventor Werner Kade	Inventor's Signature	Date
Residence Neenah, Wisconsin 54956	Country of Citizenship Germany	
Post Office Address 521 Harbor Light Court, Neenah, Wisconsin 54956, USA		
Full name of Fourth Joint Inventor Albrecht Meinecke	Inventor's Signature <i>Albrecht Meinecke</i>	Date 28.5.96
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Hans-Holbein-Str. 39, D-7920 Heidenheim, Germany		
Full name of Fifth Joint Inventor Wilhelm Wanke	Inventor's Signature <i>W. Wanke</i>	Date 20. May 1996
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Donauschwabenstr. 47, D-7920 Heidenheim, Germany		

OPGS FORM DEZ (790)

CONTINUED ON PAGE 3

Page 3

UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR CONTINUING APPLICATION		OGC FILE NO. P/14-363
<p>I hereby appoint OSTROLENK, FABER, GERB & SOFFEN and the members of the firm, Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Berliner—Reg. No. 18,653; Robert C. Faber—Reg. No. 24,322; Edward A. Meilman—Reg. No. 24,735; Stanley H. Lieberstein—Reg. No. 22,400; Steven I. Weisburd—Reg. No. 27,409; Max Moskowitz—Reg. No. 30,576; Stephen A. Soffen—Reg. No. 31,063; and James A. Flander—Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.</p> <p>SEND CORRESPONDENCE TO:</p> <p style="text-align: center;">OSTROLENK, FABER, GERB & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NEW YORK 10036-8403 DIRECT TELEPHONE CALLS TO: (212) 382-0700</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>		
Full name of 6th Inventor Hans-Jürgen Wulz Residence D-7920 Heidenheim Post Office Address Inselstr. 11, D-7920 Heidenheim, Germany	Inventor's Signature  Date 20 May 96	Country of Citizenship Germany
Full name of 7th Inventor Rudolf Bück * Residence D-7920 Heidenheim Post Office Address Schlosshaustr. 53, D-7920 Heidenheim, Germany	Inventor's Signature Date 	Country of Citizenship Germany
BY HIS LEGAL REPRESENTATIVE  Mrs. Else Bück		

* By his legal representative

UNITED STATES OF AMERICA		OPGS FILE NO.
COMBINED DECLARATION AND POWER OF ATTORNEY		P/14-363
FOR	CONTINUING	APPLICATION

I hereby appoint OSTROLENK, FABER, GERB & SOFFEN and the members of the Firm, Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Berliner—Reg. No. 18,653; Robert C. Faber—Reg. No. 24,322; Edward A. Meilman—Reg. No. 24,735; Stanley H. Lieberstein—Reg. No. 22,400; Steven I. Weisburd—Reg. No. 27,409; Max Moskowitz—Reg. No. 30,576; Stephen A. Soffen—Reg. No. 31,063; and James A. Pinder—Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.

SEND CORRESPONDENCE TO:

OSTROLENK, FABER, GERB & SOFFEN
1180 AVENUE OF THE AMERICAS
NEW YORK, NEW YORK 10036-4403
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of 6th Inventor	Inventor's Signature	Date
Hans-Jürgen Wulz		
Residence	Country of Citizenship	
D-7920 Heidenheim	Germany	
Post Office Address		
Inselstr. 11, D-7920 Heidenheim, Germany		
Full name of 7th Inventor	Inventor's Signature	Date
Rudolf Buck *		
Residence	Country of Citizenship	
D-7920 Heidenheim	Germany	
Post Office Address		
Schlossstr. 53, D-7920 Heidenheim, Germany		

BY HIS LEGAL REPRESENTATIVE

Mrs. Elsa Buck

* By his legal representative

PRINT OF DRAWINGS
AS ORIGINALLY FILED

Fig.1

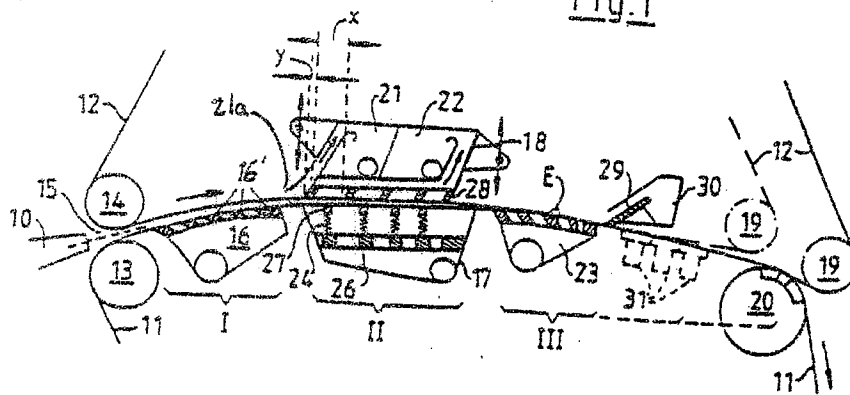


Fig.2

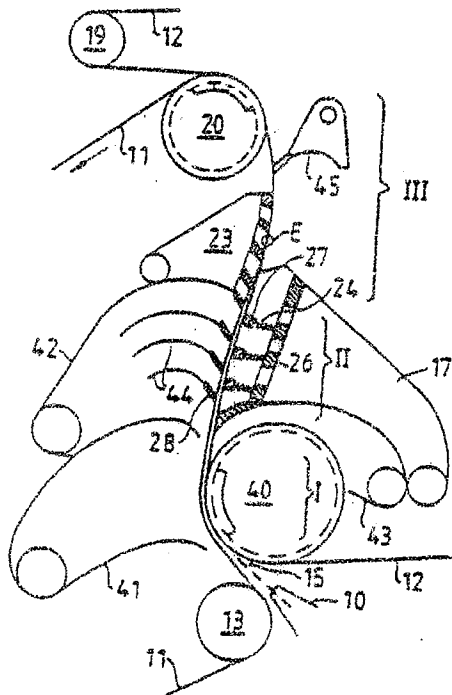
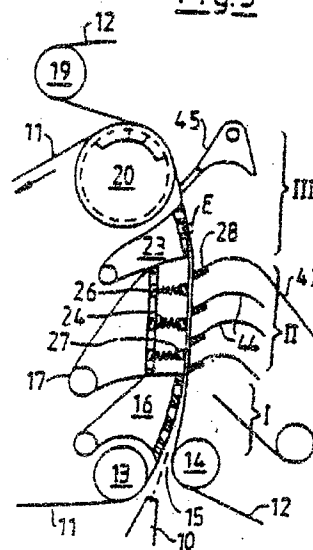
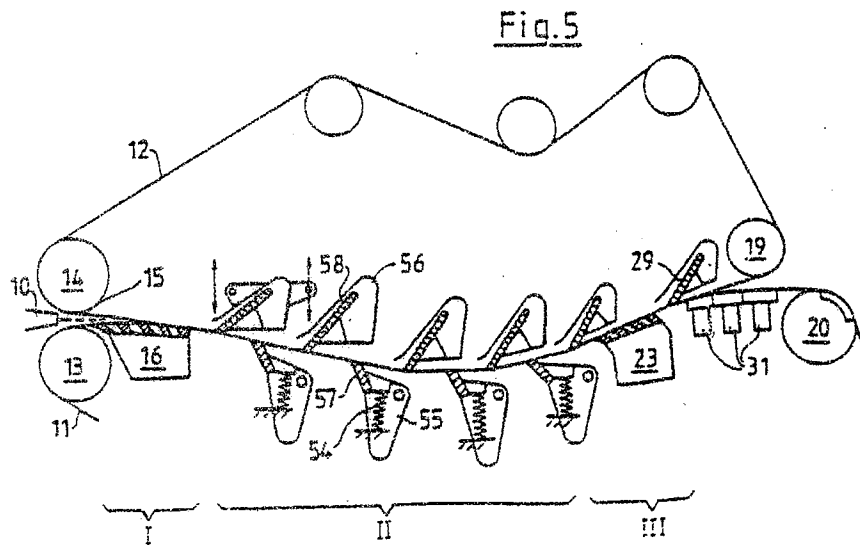
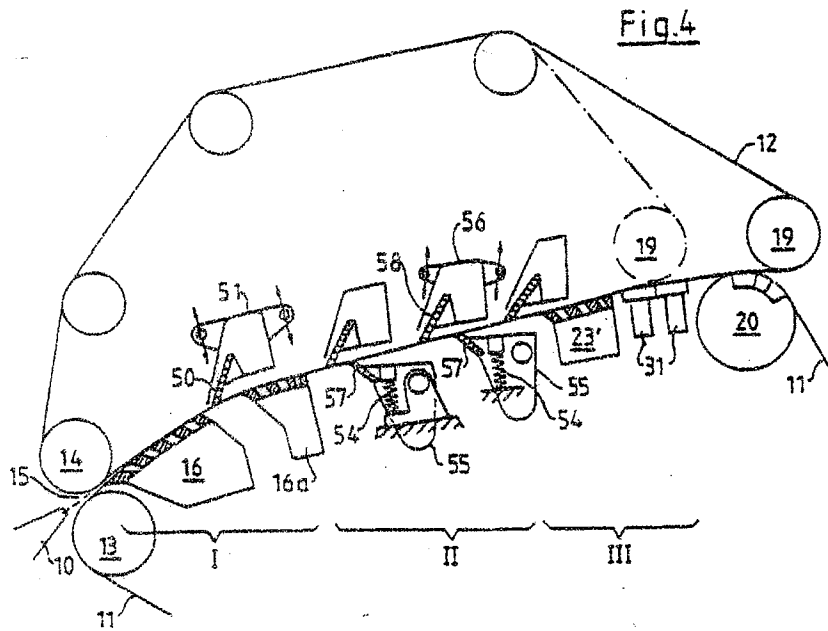


Fig.3



006138-092598

PRINT OF DRAWINGS
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09/25/98
F618 U.S. PTO

OFGS File: P/14-385

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Rudolf Buck et al.

Date: September 25, 1998

Serial No.:

Filed: Herewith

For: TWIN WIRE FORMER

Hon. Commissioner of Patents and Trademarks
Washington, DC 20231

REQUEST FOR CONTINUING APPLICATION UNDER 37 C.F.R. 1.53(b)

Sir:

This is a request for the filing of a Continuing application under the provisions of 37 C.F.R. 1.53(b) of allowed application Serial No. 09/023,435, filed February 13, 1998; which is a continuing application of Serial No. 08/556,769, filed November 2, 1995, now Patent No. 5,718,805; which is a continuing application of Serial No. 08/286,948, filed August 8, 1994, now Patent No. 5,500,091; which is a continuing application of Serial No. 08/055,918, filed April 29, 1993, now Patent No. 5,389,206; which is a continuing application of Serial no. 07/773,965, filed November 12, 1991, now abandoned; by inventors Rudolf Buck, Dieter Egelhof, Klaus Henseler, Werner Wade, Albrecht Meinecke, Wilhelm Wanke and Hans-Jurgen Wulz entitled TWIN WIRE FORMER. The prior applications are hereby incorporated by reference.

Enclosed is a copy of the prior application, including the oath or declaration as originally filed.

I hereby state that the attached papers are a copy of prior application Serial No. 09/023,435, filed February 13, 1998, without any new matter therein.

Cancel in this application original claims 2-30 of the prior application before calculating the filing fee.

The filing fee is calculated as follows:

BASIC Filing Fee:\$ 790.00
 Number of Claims in Excess of 20: ____ x \$22
 Number of Independent Claims over 3: ____ x \$82
 One or more multiple dependent claims: \$270.....\$
 TOTAL FILING FEE:\$ 790.00

Check No. 79704 which includes the amount of \$790.00 in payment of the filing fee is enclosed herewith.

The Patent and Trademark Office is hereby authorized to charge any additional fees or credit any refund, at any time during the prosecution of this application, to Deposit Account No. 15-0700.

Please amend the specification as follows:

Page 1, line 4-10, delete in their entirety and substitute a new paragraph as follows:

--This is a continuing application of, and hereby incorporates by reference the entire disclosure of, application Serial No. 09/023,435, filed February 13, 1998, allowed, which is a continuing application of Serial No. 08/556,769, filed ~~February 17, 1998~~ ^{November 2, 1995}, now Patent No. 5,718,805, which is a continuing application of Serial no. 08/286,948, filed August 8, 1994, now Patent No. 5,500,091, which is a continuing application of Serial No. 08/055,918, filed April 29, 1993, now Patent No. 5,382,206, which is a continuing application of Serial No. 07/773,965, filed November 12, 1991, now abandoned. ^{Filed as PCT/EP 90/0131 on Sept 8, 1990, now abandoned}

This application includes two (2) sheets of drawings containing figures 1 through 5.

Priority under 35 U.S.C. §119 based on German Application No. P3927597.3, filed August 22, 1989, is claimed. The certified copy of the priority application has been filed in

said prior application Serial No. 08/055,918, filed April 29, 1993.

The prior application was assigned to J.M. Voith GmbH and is recorded at Reel 7973, Frame 0629.

The power of attorney in the prior application, as originally filed, is to customer no. 2352, OSTROLENK, FABER, GERB & SOFFEN, LLP, 1180 Avenue of the Americas, New York, New York 10036-8403, and the members of the firm: Reg. No. 17,542; Samuel H. Weiner, Reg. No. 18,510; Jerome M. Berliner, Reg. No. 18,653; Robert C. Faber, Reg. No. 24,322; Edward A. Meilman, Reg. No. 24,735; Stanley H. Lieberstein, Reg. No. 22,400; Steven I. Walsburd, Reg. No. 27,409; Max Moskowitz, Reg. No. 30,576; Stephen A. Soffen, Reg. No. 31,063; and James A. Finder, Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent and Trademark Office in connection therewith and to receive all correspondence. The Power appears in the original papers in the prior application.

SEND CORRESPONDENCE TO:

DIRECT TELEPHONE CALLS TO:

OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 Avenue of the Americas
New York, New York 10036-8403
Customer No. 2352

(212) 382-0700

EXPRESS MAIL CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail Post Office to Addressee (mail label #TB83212172XUS) in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on September 25, 1998:

DOROTHY JENKINS

Name of Person Mailing Correspondence

Dorothy Jenkins

Signature

September 25, 1998

Date of Signature

MP:arr/rk

Respectfully submitted,

M. Pfeffer

Martin Pfeffer

Registration No.: 20,808
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 Avenue of the Americas
New York, New York 10036-8403
Telephone: (212) 382-0700

EXHIBIT

4

PART 2

#3B
DM
11/17/98
P/14-385

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Rudolf BUCK et al.

Date: September 25, 1998

Serial No.:

Group Art Unit:

Filed: Herewith

Examiner:

For: TWIN WIRE FORMER

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Preliminary to the examination of the above-identified application, please amend the application as follows:

IN THE CLAIMS:

Please cancel claim 1 without prejudice.

Please add the following new claims:

--31. A method for the production of a paper web from a fiber suspension in a twin wire former comprising:

causing first and second web forming wire belts to travel along a path together to form a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, each wire belt forming an endless loop;

feeding the wire belts across a single forming roll at the start of the path through the twin wire zone;

supporting the wire belts such as to form a wedge shaped entrance slot into the twin wire zone;

supplying a fiber suspension from a headbox directly to the wedge shaped entrance slot of the twin wire zone;

draining water from the fiber suspension by means of
 15 the forming roll in order to start the forming of the web from
 the fiber suspension;

feeding the wire belts with the fiber suspension and
 the web being generated therebetween downstream of the forming
 roll between a plurality of first drainage strips, which are
 20 positioned within the loop of the first wire belt for contacting
 the first wire belt, and a plurality of second drainage strips,
 which are positioned within the loop of the second wire belt for
 contacting the second wire belt, the first strips being shifted
 in position along the path of the wire belts with respect to the
 25 second strips so that the first and second strips are offset and
 in a non-opposing relationship;

resiliently supporting the first drainage strips
 against the first wire belt that the strips contact;
 rigidly supporting the second drainage strips against
 30 the second wire belt;

feeding the wire belts with the web therebetween
 downstream of said drainage strips across a stationary drainage
 element and across a suction roll in the twin wire zone such that
 as the wire belts travel over the stationary drainage element and
 over said suction roll, water is drained through the wire belt in
 contact with said stationary drainage element and with said
 suction roll; and

maintaining the twin wire zone apart from said single
 forming roll and said suction roll free of rolls which would
 40 deflect the twin wire zone.

²/₂₂. The method of claim ¹/₂₁, further comprising
 supplying a vacuum in the area of the second drainage strips.

33. A twin-wire former for the production of a paper
 web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts which travel
 along a path together for forming a twin wire zone of the twin
 wire former, with the web between the wire belts as the wire

5

AMDT 262455

belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which

10 includes a single forming roll at the start of the path of the wire belts through the twin wire zone; supports which support the wire belts for forming a wedge shaped entrance slot into the first section;

15 a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

20 said single forming roll having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the wire belts through the twin wire zone, the single forming roll being engaged by one of the wire belts and being arranged for curving the path of both wire belts around the single forming roll after the entrance of the suspension into the entrance slot;

25 the twin wire zone having a second section following the first section along the path of the wire belts through the twin wire zone; in the second section, a plurality of the first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; a first strip support which resiliently supports the first drainage strips against the first wire belt that the first strips contact;

35 a second strip support which supports the second drainage strips rigidly against the second wire belt;

40 the twin wire zone having a third section following the second section along the path of the wire belts through the twin

45 wire zone; drainage elements in the third section, for being engaged by one of the wire belts as the wire belts travel over the drainage elements, the drainage elements including a suction roll and having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone apart from said single forming roll and said suction roll being free of rolls which deflect the twin wire zone.

34. The twin-wire former of claim 33, further comprising a supplier of vacuum in the area of the second drainage strips.

35. A method for the production of a paper web from a fiber suspension in a twin wire former comprising:

causing first and second web forming wire belts to travel along a path together to form a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, each wire belt forming an endless loop;

feeding the wire belts across a stationary curved forming shoe at the start of the path through the twin wire zone;

supporting the wire belts such as to form a wedge shaped entrance slot into the twin wire zone;

supplying a fiber suspension from the head box directly to the wedge shaped entrance slot of the twin wire zone;

15 draining water from the fiber suspension by means of the forming shoe in order to start the forming of the web from the fiber suspension;

20 feeding the wire belts with the fiber suspension and the web being generated therebetween downstream of the forming shoe between a plurality of first drainage strips, which are positioned within the loop of the first wire belt for contacting the first wire belt, and a plurality of second drainage strips, which are positioned within the loop of the second wire belt for contacting the second wire belt, the first strips being shifted

25 in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship;

resiliently supporting the first drainage strips against the first wire belt that the strips contact;

30 rigidly supporting the second drainage strips against the second wire belt;

feeding the wire belts with the web therebetween downstream of said drainage strips across a stationary drainage element and across a suction roll in the twin wire zone such that as the wire belts travel over the stationary drainage element and the suction roll, water is drained through the wire belt in contact with said stationary drainage element and the suction roll; and

maintaining the twin wire zone apart from said suction roll free of rolls which would deflect the twin wire zone.

36. The method of claim ⁵~~35~~, further comprising supplying a vacuum in the area of the second drainage strips.

37. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts which travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which

10 includes a stationary curved forming shoe at the start of the path of the wire belts through the twin wire zone; supports which support the wire belts for forming a wedge shaped entrance slot into the first section;

15 a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the

headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

20 said stationary curved forming shoe having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the wire belts through the twin wire zone, the forming shoe being engaged by one of the wire belts and being arranged for curving the path of both wire belts around the forming shoe after the entrance of the suspension into the entrance slot;

25 the twin wire zone having a second section following the first section along the path of the wire belts through the twin wire zone; in the second section, a plurality of the first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belts; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; a first strip support which
35 resiliently supports the first drainage strips against the first wire belt that the first strips contact;

38 a second strip support which supports the second drainage strips rigidly against the second wire belt;

40 the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a stationary drainage element and a suction roll in the third section, for being engaged by one of the wire belts as the wire belts travel over the stationary drainage element and said suction roll, the stationary drainage element and said suction roll having an open surface to enable water to be drained through the wire belt in contact therewith; and

45 the twin wire zone apart from said suction roll being free of rolls which deflect the twin wire zone.

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⁸
~~38~~. The twin-wire former of claim ⁷~~31~~, further comprising a supplier of vacuum in the area of the second drainage strips.--

REMARKS

Claim 1 has been cancelled. Claims 31-38 have been added to more adequately protect applicants' invention.

EXPRESS MAIL CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail Post Office to Addressee (mail label #TB83212172XUS) in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on September 25, 1998:

Dorothy Jenkins
Name of Person Mailing Correspondence

Dorothy Jenkins
Signature

September 25, 1998
Date of Signature

Respectfully submitted,

M. Pfeffer
Martin Pfeffer

Registration No.: 20,808
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 Avenue of the Americas
New York, New York 10036-8403
Telephone: (212) 382-0700

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COMM-FIELD

MP:arr

[Handwritten signature]



**UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office**

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/161,138	09/25/98	EDELHOF	P714-385

002352 IM31/0104
OSTROLENK FABER GERB & SOFFEN
1180 AVENUE OF THE AMERICAS
NEW YORK NY 10036-8403

EXAMINER
HASTINGS, R.

ART UNIT	PAPER NUMBER
1731	

DATE MAILED: 01/04/99

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. <u>09161138</u>	Applicant(s) <u>Egelhof et al</u>
	Examiner <u>Hastings</u>	Group Art Unit <u>1731</u>

—The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address—

Period for Response

A SHORTENED STATUTORY PERIOD FOR RESPONSE IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a response be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for response specified above is less than thirty (30) days, a response within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for response is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to respond within the set or extended period for response will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

☒ Responsive to communication(s) filed on 9-25-98

☐ This action is FINAL.

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 O.D. 11; 453 O.G. 213.

Disposition of Claims

☒ Claim(s) 31-38 is/are pending in the application.

Of the above claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 31-38 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claim(s) _____ are subject to restriction or election requirement.

Application Papers

☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been received.

☐ received in Application No. (Series Code/Serial Number) _____

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

Attachment(s)

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s) _____

☒ Notice of References Cited, PTO-892

☒ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Interview Summary, PTO-413

☐ Notice of Informal Patent Application, PTO-152

☐ Other _____

Office Action Summary

Application/Control Number: 08/161,138

Page 2

Art Unit: 1731

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 31-38 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the claims of U.S. Patent No. 5,389,206; 5,500,091; 5,718,805; and 5,853,544. Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant claims are merely of slightly differing scope; for example, use of vacuum or not for the third section stationary drainage element would have been within the ordinary level of skill in the art as is the use of a suction roll for separating the twin wires (in the third section).

Claims 31-38 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Application/Control Number: 08/161,138

Page 3

Art Unit: 1731

Claim 31 line 33 insert --then--before "across" to be clear about the location of the suction roll. Likewise in claim 35, line 33 insert -- then before "across" and in claim 37 line 43 change "and" to --followed by --.

Claim 33 is incomplete in failing to recite at least one stationary drainage element in the third section. Correction is necessary.

Claims 33 and 34 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. A third section with a stationary drainage element is critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). (The original specification and Jepson format of the claims clearly included a third section with a stationary dewatering element as an essential feature of the invention. Every figure shows section I, II, and III, and every section III includes a stationary dewatering element. Thus please amend claim 33 line 44 after "including" by inserting -- at least one stationary dewatering element followed -- before "a suction roll". Note in all instances, the suction roll 20 is in addition to stationary drainage element of the third dewatering section.

If a terminal disclaimer were filed and all changes made to
Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Examiner Hastings whose telephone number is (703) 308-0470.

The examiner can normally be reached on Monday-Thursday from 6:30 am to 5:00 pm.

Obviate 112 rejections, claims 31-38 would be allowable.

Application/Control Number: 08/161,138

Page 4

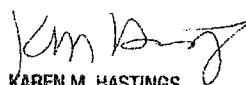
Art Unit: 1731

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Stan Silverman, can be reached on (703) 308-3857. The fax phone number for the organization where this application or proceeding is assigned is (703) 305-7115.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0651.

Hastings/vr

12-23-98


KAREN M. HASTINGS
PRIMARY EXAMINER
GROUP 1300

12-98

Form PTO 648 (Rev. 8-98)

U.S. DEPARTMENT OF COMMERCE - Patent and Trademark Office

Application No. 09/161,138NOTICE OF DRAFTSPERSON'S
PATENT DRAWING REVIEWThe drawing(s) filed (insert date) 09/25/98 are:A. ☒ approved by the Draftsperson under 37 CFR 1.84 or 1.152.B. ☐ objected to by the Draftsperson under 37 CFR 1.84 or 1.152 for the reasons indicated below. The Examiner will require submission of new, corrected drawings when necessary. Corrected drawing must be submitted according to the instructions on the back of this notice.

<p>1. DRAWINGS. 37 CFR 1.84(a): Acceptable categories of drawings: Black ink. Color. Color drawings are not acceptable until action is granted. Fig(s) _____ Pencil and non black ink not permitted. Fig(s) _____</p> <p>2. PHOTOGRAPHS. 37 CFR 1.84(h) 1 half tone set is required. Fig(s) _____ Photographs not properly mounted (must use crystal board or photographic double-weight paper). Fig(s) _____ Poor quality (half-tone). Fig(s) _____</p> <p>3. TYPE OF PAPER. 37 CFR 1.84(e) Paper not flexible, strong, white, and durable. Fig(s) _____ Erasures, alterations, overwritings, interlineations, folds, copy machine marks not accepted. Fig(s) _____ Mylar, vellum paper is not acceptable (too thin). Fig(s) _____</p> <p>4. SIZE OF PAPER. 37 CFR 1.84(f): Acceptable sizes: 21.3 cm by 29.7 cm (DIN size A4) 21.6 cm by 27.9 cm (8 1/2 x 11 inches) All drawing sheets not the same size. Sheet(s) _____ Drawings sheets not an acceptable size. Fig(s) _____</p> <p>5. MARGINS. 37 CFR 1.84(g): Acceptable margins: Top 2.5 cm Left 2.5 cm Right 1.5 cm Bottom 1.0 cm SIZE: A4 Size Top 2.5 cm Left 2.5 cm Right 1.5 cm Bottom 1.0 cm SIZE: 8 1/2 x 11 Margins not acceptable. Fig(s) _____ Top (T) _____ Left (L) _____ Right (R) _____ Bottom (B) _____</p> <p>6. VIEWS. 37 CFR 1.84(h) REMINDER: Specification may require revision to correspond to drawing changes. Partial views. 37 CFR 1.84(h)(2) Brackets needed to show figure as one entity. Fig(s) _____ Views not labeled separately or properly. Fig(s) _____ Enlarged view not labeled separately or properly. Fig(s) _____</p> <p>7. SECTIONAL VIEWS. 37 CFR 1.84(h)(3) Hatching not indicated for sectional portions of an object. Fig(s) _____ Sectional designation should be noted with Arabic or Roman numbers. Fig(s) _____</p>	<p>8. ARRANGEMENT OF VIEWS. 37 CFR 1.84(i) Words do not appear on a horizontal, left-to-right fashion when page is either upright or turned so that the top becomes the right side, except for graphs. Fig(s) _____</p> <p>9. SCALE. 37 CFR 1.84(k) Scale not large enough to show mechanism without crowding when drawing is reduced in size to two-thirds in reproduction. Fig(s) _____</p> <p>10. CHARACTER OF LINES, NUMBERS, & LETTERS. 37 CFR 1.84(j) Lines, numbers & letters not uniformly thick and well defined, clean, durable, and black (poor line quality). Fig(s) _____</p> <p>11. SHADING. 37 CFR 1.84(m) Solid black areas pale. Fig(s) _____ Solid black shading not permitted. Fig(s) _____ Shade lines, pale, rough and blurred. Fig(s) _____</p> <p>12. NUMBERS, LETTERS, & REFERENCE CHARACTERS. 37 CFR 1.84(p) Numbers and reference characters not plain and legible. Fig(s) _____ Figure legends are poor. Fig(s) _____ Numbers and reference characters not oriented in the same direction as the view. 37 CFR 1.84(p)(1) Fig(s) _____ English alphabet not used. 37 CFR 1.84(p)(2) Fig(s) _____ Numbers, letters and reference characters must be at least .32 cm (1/8 inch) in height. 37 CFR 1.84(p)(3) Fig(s) _____</p> <p>13. LEAD LINES. 37 CFR 1.84(q) Lead lines cross each other. Fig(s) _____ Lead lines missing. Fig(s) _____</p> <p>14. NUMBERING OF SHEETS OF DRAWINGS. 37 CFR 1.84(i) Sheets not numbered consecutively, and in Arabic numerals, beginning with number 1. Sheet(s) _____</p> <p>15. NUMBERING OF VIEWS. 37 CFR 1.84(u) Views not numbered consecutively, and in Arabic numerals, beginning with number 1. Fig(s) _____</p> <p>16. CORRECTIONS. 37 CFR 1.84(w) Corrections not made from prior PTO-948 dated _____</p> <p>17. DESIGN DRAWINGS. 37 CFR 1.152 Surface shading shown not appropriate. Fig(s) _____ Solid black shading not used for color contrast. Fig(s) _____</p>
<p>COMMENTS</p>	

REVIEWER LAMDATE 12/15/98

TELEPHONE NO. _____

ATTACHMENT TO PAPER NO. 44

Notice of References Cited				Application No. <i>09/16/138</i>	Applicant(s) <i>Egelhof et al</i>	
				Examiner <i>Hastings</i>	Group Art Unit <i>1731</i>	
				Page <i>1</i> of <i>1</i>		
U.S. PATENT DOCUMENTS						
*	DOCUMENT NO.	DATE	NAME	CLASS	SUBCLASS	
V A	<i>5389206</i>	<i>2/93</i>	<i>Buck et al</i>	<i>112</i>	<i>301</i>	
V B	<i>3994774</i>	<i>11/76</i>	<i>Malina et al</i>	<i>162</i>	<i>301</i>	
V C	<i>4609435</i>	<i>9/86</i>	<i>Tissari</i>	<i>162</i>	<i>301</i>	
V D	<i>4769111</i>	<i>9/88</i>	<i>Nevalaime et al</i>	<i>162</i>	<i>351</i>	
V E	<i>4917766</i>	<i>4/90</i>	<i>Koivumäki et al</i>	<i>162</i>	<i>301</i>	
V F	<i>4925531</i>	<i>5/90</i>	<i>Koski</i>	<i>162</i>	<i>301</i>	
G						
H						
I						
J						
K						
L						
M						
FOREIGN PATENT DOCUMENTS						
*	DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS	SUBCLASS
V N	<i>3321406</i>	<i>6/83</i>	<i>DE</i>	<i>—</i>	<i>—</i>	<i>—</i>
V O	<i>3138133</i>	<i>9/81</i>	<i>DE</i>	<i>—</i>	<i>—</i>	<i>—</i>
F						
Q						
R						
S						
T						
NON-PATENT DOCUMENTS						
*	DOCUMENT (including Author, Title, Source, and Pertinent Pages)				DATE	
U						
V						
W						
X						

* A copy of this reference is not being furnished with this Office action.
(See Manual of Patent Examining Procedure, Section 707.05(a).)

See 1731
#5 BM
1-799

P/14-385

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
In re Patent Application of Rudolf BUCK, et al.
Serial No.: 09/161,138
Filed: September 25, 1998
For: TWIN WIRE FORMER



New York, New York
Date: December 9, 1998

Assistant Commissioner for Patents
Washington, D.C. 20231

INFORMATION DISCLOSURE STATEMENT

Sir:

Submitted herewith is a copy of art together with a form listing the same for the convenience of the Examiner.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231, on December 9, 1998:

Respectfully submitted,

Martin Pfeffer, Esq.
Name of applicant, assignee or
Registered Representative
Signature
December 9, 1998
Date of Signature

Martin Pfeffer
Registration No.: 20,808
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 Avenue of the Americas
New York, New York 10036-8403
Telephone: (212) 382-0700

MP:jy
Enclosures

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DEC 15 1998

GROUP 1700

P/3312-15

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Patent Application of

Rudolf BUCK, et al.

Serial No. 09/161,138

Filed: September 25, 1998

For: TWIN WIRE FORMER

Date: February 25, 1999

Group Art Unit: 1731

Examiner: K. Hastings



Assistant Commissioner for Patents
Washington, D.C. 20231

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GROUP 1700

AMENDMENT

Sir:

In response to the Office Action dated January 4, 1999,
please reconsider the above-identified application amended as
follows:

IN THE CLAIMS:

Please amend the claims as follows:

13. (Amended) A method for the production of a paper
web from a fiber suspension in a twin wire former comprising:
causing first and second web forming wire belts to
travel along a path together to form a twin wire zone of the twin
wire former, with the web between the wire belts as the wire
belts travel along the path through the twin wire zone, each wire
belt forming an endless loop;
feeding the wire belts across a single forming roll at
the start of the path through the twin wire zone;
supporting the wire belts such as to form a wedge
shaped entrance slot into the twin wire zone;
supplying a fiber suspension from a headbox directly to
the wedge shaped entrance slot of the twin wire zone;
draining water from the fiber suspension by means of
the forming roll in order to start the forming of the web from
the fiber suspension;

AMDT2871/3

feeding the wire belts with the fiber suspension and the web being generated therebetween downstream of the forming roll between a plurality of first drainage strips, which are positioned within the loop of the first wire belt for contacting the first wire belt, and a plurality of second drainage strips, which are positioned within the loop of the second wire belt for contacting the second wire belt, the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship;

resiliently supporting the first drainage strips against the first wire belt that the strips contact;

rigidly supporting the second drainage strips against the second wire belt;

feeding the wire belts with the web therebetween downstream of said drainage strips across a stationary drainage element and then across a suction roll in the twin wire zone such that as the wire belts travel over the stationary drainage element and over said suction roll, water is drained through the wire belt in contact with said stationary drainage element and with said suction roll; and

maintaining the twin wire zone apart from said single forming roll and said suction roll free of rolls which would deflect the twin wire zone.

33. (Amended) A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts which travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a single forming roll at the start of the path of the wire belts through the twin wire zone; supports which support the

wire belts for forming a wedge shaped entrance slot into the first section;

a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

said single forming roll having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the wire belts through the twin wire zone, the single forming roll being engaged by one of the wire belts and being arranged for curving the path of both wire belts around the single forming roll after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the wire belts through the twin wire zone; in the second section, a plurality of the first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; a first strip support which resiliently supports the first drainage strips against the first wire belt that the first strips contact;

a second strip support which supports the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; drainage elements in the third section, for being engaged by one of the wire belts as the wire belts travel over the drainage elements, the drainage elements including at least one stationary dewatering element followed by a suction roll and having an open surface to enable water to be drained through the wire belt in contact therewith; and

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Cate
the twin wire zone apart from said single forming roll and said suction roll being free of rolls which deflect the twin wire zone.

5.35. (Amended) A method for the production of a paper web from a fiber suspension in a twin wire former comprising:
causing first and second web forming wire belts to travel along a path together to form a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, each wire belt forming an endless loop;

feeding the wire belts across a stationary curved forming shoe at the start of the path through the twin wire zone;

supporting the wire belts such as to form a wedge shaped entrance slot into the twin wire zone;

supplying a fiber suspension from the head box directly to the wedge shaped entrance slot of the twin wire zone;

draining water from the fiber suspension by means of the forming shoe in order to start the forming of the web from the fiber suspension;

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feeding the wire belts with the fiber suspension and the web being generated therebetween downstream of the forming shoe between a plurality of first drainage strips, which are positioned within the loop of the first wire belt for contacting the first wire belt, and a plurality of second drainage strips, which are positioned within the loop of the second wire belt for contacting the second wire belt, the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship;

resiliently supporting the first drainage strips against the first wire belt that the strips contact;

rigidly supporting the second drainage strips against the second wire belt;

feeding the wire belts with the web therebetween downstream of said drainage strips across a stationary drainage element and then across a suction roll in the twin wire zone such

C3
cont'd
that as the wire belts travel over the stationary drainage element and the suction roll, water is drained through the wire belt in contact with said stationary drainage element and the suction roll; and

maintaining the twin wire zone apart from said suction roll free of rolls which would deflect the twin wire zone.

737. (Amended) A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts which travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a stationary curved forming shoe at the start of the path of the wire belts through the twin wire zone; supports which support the wire belts for forming a wedge shaped entrance slot into the first section;

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a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

said stationary curved forming shoe having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the wire belts through the twin wire zone, the forming shoe being engaged by one of the wire belts and being arranged for curving the path of both wire belts around the forming shoe after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the wire belts through the twin wire zone; in the second section, a plurality of the first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belts; in the second

section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; a first strip support which resiliently supports the first drainage strips against the first wire belt that the first strips contact;

a second strip support which supports the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a stationary drainage element [and] followed by a suction roll in the third section, for being engaged by one of the wire belts as the wire belts travel over the stationary drainage element and said suction roll, the stationary drainage element and said suction roll having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone apart from said suction roll being free of rolls which deflect the twin wire zone.

REMARKS

Claims 31-38 stand rejected under the judicially created doctrine of obviousness-type double patenting and also stand rejected under 35 U.S.C. §112, second paragraph. In addition, claims 33 and 34 stand rejected under 35 U.S.C. §112, first paragraph.

Although Applicants do not agree that there is double patenting, Applicants, nonetheless, enclose herewith a Terminal Disclaimer. Accordingly, it is respectfully submitted that the rejection of claims 31-33, on this ground, has been overcome.

Applicants have amended claims 31, 33 and 35 in accordance with the Examiner's specific request. Accordingly, it is respectfully submitted that claims 31-38 now fully comply with 35 U.S.C. §112, first and second paragraphs.

In view of the foregoing, this application is now believed to be in condition for allowance. Accordingly, reconsideration and allowance of the application are respectfully requested.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231, on February 25, 1999:

Respectfully submitted,



Martin Pfeffer

Name of applicant, assignee or
Registered Representative



Signature

February 25, 1999

Date of Signature

Martin Pfeffer
Registration No.:
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 Avenue of the Americas
New York, New York 10036-8403
Telephone: (212) 382-0700

MP:jy

OFGS File No. P/3312-15

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Rudolf BUCK, et al.

Serial No.: 09/161,138

Filed: February 13, 1998

For: TWIN WIRE FORMER

Date: February 25, 1999

Group Art Unit: 1731

Examiner: K. Hastings



Assistant Commissioner for Patents
Washington, DC 20231

TERMINAL DISCLAIMER TO OBVIATE DOUBLE PATENTING
REJECTION (37 CFR §1.321(b))

Interest of Person Making This Disclaimer

I, Robert C. Faber of Ostrolenk, Faber, Gerb & Soffen, LLP with offices at 1180 Avenue of the Americas, New York, New York 10036-8403, represent that I am an attorney of record for the assignee identified below owning all of the interest in this application.

Identity and Title of Disclaimant

Name of assignee: Voith Sulzer Papiertechnik Patent GmbH

Disclaimer

Voith Sulzer Papiertechnik Patent GmbH hereby disclaims the terminal part of any patent granted on the above-identified present application which would expire beyond any of the expiration dates of the full statutory terms of United States Patent Nos. 5,389,206, 5,500,091, 5,718,805 and 5,853,544; and agrees that any patent so granted on the above-identified present application shall be enforceable only for and during such period that the legal title to said patent shall be the same as the legal title to United States Patent Nos. 5,389,206, 5,500,091, 5,718,805 and 5,853,544, this agreement to run with any patent granted on the above-identified present application and to be binding upon the grantee, its successors or assigns; and

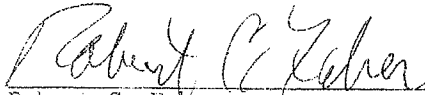
MISC1258353

#7
AW
3-18-99

does not disclaim any terminal part of any patent granted on said above-identified present application that would extend to the full statutory term of any of United States Patent Nos. 5,389,206, 5,500,091, 5,718,805 and 5,853,544 in the event that any of said United States Patent Nos. 5,389,206, 5,500,091, 5,718,805 or 5,853,544 later expires for failure to pay a maintenance fee, is held unenforceable, is found invalid, is statutorily disclaimed in whole or terminally disclaimed under 37 C.F.R. 1.321(a), has all claims cancelled by a reexamination certificate, or is otherwise terminated prior to the expiration of its statutory term, except for the separation of legal title stated above.

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further, that these statements are made with the knowledge that willful false statements, and the like so made, are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

1/25/99
Date


Robert C. Faber

P/3312-15

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Rudolf BUCK, et al.

Serial No.: 09/161,138

Filed: February 13, 1999

For: TWIN WIRE FORMER

Date: February 25, 1999

Group Art Unit: 1731

Examiner: K. Hastings



RECEIVED

MAR 08 1999

GROUP 1700

AMENDMENT TRANSMITTAL LETTER - FEE COMPUTATION

Assistant Commissioner for Patents
Washington, D.C. 20231

Transmitted herewith is an amendment in the above-identified application.

"Small Entity" status (37 C.F.R. §1.9 & §1.27) established
previously by enclosed verified statement.OPGS Check No. _____, which includes the fee of \$ -0- calculated
below, is attached.

NO. CLAIMS AFTER AMENDMENT	HIGHEST NO. PREVIOUSLY PAID FOR	EXTRA PRESENT	RATE	ADDIT. FEE
TOTAL 8 MINUS 20	* =	x (\$9 SE or \$18)	\$0.00	
INDEP. 4 MINUS 4	** =	x (\$39 SE or \$78)	\$0.00	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM			x (\$130 SE or \$260)	\$0.00
* not less than 20 ** not less than 3			TOTAL	\$0.00

In the event the actual fee is greater than the payment submitted
or is inadvertently not enclosed or if any additional fee during
the prosecution of this application is not paid, the Patent Office
is authorized to charge the underpayment to Deposit Account No.
15-0700.If this communication is filed after the shortened statutory time
period had elapsed and no separate Petition is enclosed, the
Commissioner of Patents and Trademarks is petitioned, under 37
C.F.R. §1.136(a), to extend the time for filing a response to the
outstanding Office Action by the number of months which will avoid
abandonment under 37 C.F.R. §1.135. The fee under 37 C.F.R. § 1.17
should be charged to our Deposit Account No. 15-0700.I hereby certify that this correspondence is being
deposited with the United States Postal Service with
sufficient postage as first class mail in an envelope
addressed to: Assistant Commissioner for Patents,
Washington, D.C. 20231, on February 25, 1999:

Martin Pfeffer

Name of Registered Representative

Respectfully submitted,

Martin Pfeffer

Registration No.: 20,808

OSTROLENK, FABER, GERB & SOFFEN, LLP

1180 Avenue of the Americas

New York, New York 10036

Telephone: (212) 382-0700

03/16/1999 HTAYLOR 00000003 150700 0911138

01 FC:148 110.00 03 February 25, 1999

Date of Signature


**UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office**

 Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
09/161,135	03/25/98	EDELHOF	D P/14-385

 002052 IM31/0324
OSTROLENK FABER GERB & SOFFEN
1180 AVENUE OF THE AMERICAS
NEW YORK NY 10036-8403

EXAMINER

HASTINGS, K

ART UNIT PAPER NUMBER

1731 #8

DATE MAILED: 03/24/99

 This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS
NOTICE OF ALLOWABILITY

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance and Issue Fee Due or other appropriate communication will be mailed in due course.

☒ This communication is responsive to Papers 5-7
☒ The allowed claim(s) is/are 31-38 (renumbered 1-8)

- ☐ The drawings filed on _____ are acceptable.
- ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- ☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been
- ☐ received.
- ☐ received in Application No. (Series Code/Series Number) _____
- ☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

- ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

A SHORTENED STATUTORY PERIOD FOR RESPONSE to comply with the requirements noted below is set to EXPIRE THREE MONTHS FROM THE "DATE MAILED" of this Office action. Failure to timely comply will result in ABANDONMENT of this application. Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

- ☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-152, which discloses that the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.
- ☐ Applicant MUST submit NEW FORMAL DRAWINGS
- ☐ because the originally filed drawings were declared by applicant to be informal.
- ☐ including changes required by the Notice of Draftperson's Patent Drawing Review, PTO-948, attached hereto or to Paper No. _____
- ☐ including changes required by the proposed drawing correction filed on _____, which has been approved by the examiner.
- ☐ including changes required by the attached Examiner's Amendment/Comment.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the reverse side of the drawings. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftperson.

- ☐ Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Any response to this letter should include, in the upper right hand corner, the APPLICATION NUMBER (SERIES CODE/SERIAL NUMBER). If applicant has received a Notice of Allowance and Issue Fee Due, the ISSUE BATCH NUMBER and DATE of the NOTICE OF ALLOWANCE should also be included.

Attachment(s)

- ☐ Notice of References Cited, PTO-892
- ☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 5
- ☐ Notice of Draftperson's Patent Drawing Review, PTO-948
- ☐ Notice of Informal Patent Application, PTO-152
- ☐ Interview Summary, PTO-413
- ☐ Examiner's Amendment/Comment
- ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
- ☐ Examiner's Statement of Reasons for Allowance

 KAREN M. HASTINGS
PRIMARY EXAMINER
GROUP 1800

3-99



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

NOTICE OF ALLOWANCE AND ISSUE FEE DUE

Application No. 08/100,000
Inventor: GEORGE A. KILPATRICK
Attorney: JAMES H. KILPATRICK
New York, NY 10018-0000

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
08/100,000	08/12/00	005	4501/001, K	07/11/00
First Named Applicant	GEORGE A. KILPATRICK, JR.			

TITLE OF INVENTION
INVENTION

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
1	08/100,000	005	UTILITY	NO	\$1,100.00	08/12/00

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED.

THE ISSUE FEE MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED.

HOW TO RESPOND TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

- If the status is changed, pay twice the amount of the FEE DUE shown above and notify the Patent and Trademark Office of the change in status, or
- If the status is the same, pay the FEE DUE shown above.

If the SMALL ENTITY is shown as NO:

- Pay FEE DUE shown above, or
- File verified statement of Small Entity Status before, or with, payment of 1/2 the FEE DUE shown above.

II. Part B-Issue Fee Transmittal should be completed and returned to the Patent and Trademark Office (PTO) with your ISSUE FEE. Even if the ISSUE FEE has already been paid by charge to deposit account, Part B Issue Fee Transmittal should be completed and returned. If you are charging the ISSUE FEE to your deposit account, section "4b" of Part B-Issue Fee Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give application number and batch number. Please direct all communications prior to issuance to Box ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

08/24/99 16:12 FAX 212 398 0681

OSTROLENK, FABER

001

OSTROLENK, FABER, GERB & SOFFEN, LLP

1180 AVENUE OF THE AMERICAS, NEW YORK, NEW YORK 10036-8403
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 email@ostrolenk.com

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* DC BAR

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 FAX 202 429 8919

FACSIMILE TRANSMITTAL SHEET

TO: Ms. Pinkney
 FIRM: U.S. Patent & Trademark Office
 FACSIMILE NUMBER: (703) 308-6642
 FROM: Mr. Martin Pfeffer, Esq.
 TOTAL NUMBER OF PAGES: 3 INCLUDING COVER SHEET.
 RE: OFGS FILE NO.: P/3312-15
 YOUR REF.: U.S. Serial No. 09/161,138
 OPERATOR: _____
 DATE: 8.24.99 TIME: _____

IF YOU DID NOT RECEIVE ALL THE PAGES, PLEASE CALL BACK AS SOON AS POSSIBLE.

Facsimile Operator Phone Number:

(212) 382-0700

Direct Line to OFGS Facsimile Machine:

(212) 382-0886 or (212) 398-0681

This message is intended only for the use of the individual(s) to which it is addressed, and may contain information that is privileged, confidential or exempt from disclosure under applicable law. If the reader of this message is not an intended recipient, or the employee or agent responsible for delivering the message to an intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify us immediately by telephone and return the original message to us at the above address by mail. Thank you.

REMARKS:

08/24/99 16:12 FAX 212 398 0681

OSTROLENK, FABER

002

OSTROLENK, FABER, GERB & SOFFEN, LLP1180 AVENUE OF THE AMERICAS, NEW YORK, NEW YORK 10036-8403
TEL 212 382 0700 FAX 212 382 0888 FAX 212 398 0681 TELEX 236925

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STEVEN S. RUBINReg. Patent Agent
CHARLES C. ACHKAR, Ph.D.**OF COUNSEL**MARVIN C. SOFFEN
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J. DAVID DAINOW
*DC BAR**WASHINGTON OFFICE**
1725 K STREET, N.W.
WASHINGTON, D.C. 20006
TEL 202 457 7785
FAX 202 429 8919Writer's direct line
(212) 596-0594

August 24, 1999

VIA FACSIMILE - (703) 308-6642
Ms. Pinkney
U.S. Patent and Trademark Office
Applications Branch
Washington, D.C. 20231

Re: U.S. Serial No.: 09/161,138

Dear Ms. Pinkney:

In accordance with your telephone request, enclosed please find the information you requested with respect to the deceased inventor, Rudolf Buck.

I understand that there is some question with respect to the first name of Mr. Buck. It is spelled Rudolf.

Please note that U.S. Serial No. 09/161,138 is a continuation of U.S. Serial No. 09/023,435, which, in turn, is a continuation of U.S. Serial No. 08/556,769.

Accordingly, the declaration filed in connection with U.S. Serial No. 09/161,138 was the declaration filed in U.S. Serial No. 08/556,769.

With respect to the authority of Else Buck to sign on behalf of Mr. Buck, enclosed herewith is a paper filed in the grand parent application (U.S. Serial No. 08/556,769; Our File No. P/14-363).

If you have any further questions, please do not hesitate to contact me.

Very truly yours,

OSTROLENK, FABER, GERB & SOFFEN, LLP

Martin Preffer

MP:jjy
Enclosures

08/24/00 16:13 FAX 212 368 0681

*OSTROLENK, FABER

003

Attorney's Packet No. P/14-363

ADDED PAGE TO COMBINED DECLARATION AND POWER OF
ATTORNEY FOR SIGNING BY ADMINISTRATOR(TRIX), EXECUTOR(TRIX)
OR LEGAL REPRESENTATIVE ON BEHALF OF DECEASED OR
INCAPACITATED INVENTOR (37 CFR 1.42 AND 1.43)

Mrs. Else Bück

(type or print name(s) of administrator(trix), executor(trix), legal representative or all heirs)

hereby declare that I am a citizen of Germany
residing at Schlosshastr. 53, D-7920 Heidenheim, Germany

and that I am executing and signing the declaration to which this is attached as

(check one):

- ☐ the administrator(trix) of
☐ executor(trix) of the last will and testament of

NRX legal representative (or heirs) of
Rudolf Bück

Full name of (first, second etc.) deceased or incapacitated inventor
Germany

Country of citizenship of deceased or incapacitated inventor
D-7920 Heidenheim

Residence of deceased or incapacitated inventor
Schlosshastr. 53, D-7920 Heidenheim, Germany

Post Office Address of deceased or incapacitated inventor

That, upon information and belief, I aver those facts that the inventor is required to state.

Date: 20. May 1996

Else Bück
Mrs. Else Bück

PART B—ISSUE FEE TRANSMITTAL

and mail this form, together with applicable fees, to: **Box ISSUE FEE**
Assistant Commissioner for Patents
Washington, D.C. 20231

MAILING INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE. Blocks 1 through 4 should be completed where appropriate. All further correspondence including the Issue Fee Receipt, the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Legibly mark-up with any corrections or use Block 1)

002352 IM31/0324
 OSTROLENK, FABER, GERB & SOFFEN
 1180 AVENUE OF THE AMERICAS
 NEW YORK NY 10036-6403

Note: The certificate of mailing below can only be used for domestic mailings of the Issue Fee Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing.

Certificate of Mailing

I hereby certify that this Issue Fee Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Box Issue Fee address above on the date indicated below.

Martin Pfeffer (Depositor's name)
 (Signature)
 6/24/99 (Date)

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
09/161,138	09/25/98	008	HASTINGS, K 1731	03/24/99
First Named Applicant: EBELHOF, 35 USC 154(b) term ext. = 0 Days.				

OF TWIN WIRE FORMER
 TION

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
1 P/14-385	162-203.000	077	UTILITY	NO	\$1210.00	05/24/99

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363). Use of PTO form(s) and Customer Number are recommended, but not required.

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" indication form PTO/SB/47) attached.

2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

OSTROLENK, FABER, GERB & SOFFEN, LLP

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)
PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. Inclusion of assignee data is only appropriate when an assignment has been previously submitted to the PTO or is being submitted under separate cover. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Voith Sulzer Papiertechnik Patent GmbH

(B) RESIDENCE (CITY & STATE OR COUNTRY): Germany

Please check the appropriate assignee category indicated below (will not be printed on the patent)
☐ Individual ☒ corporation or other private group entity ☐ government

4a. The following fees are enclosed (make check payable to Commissioner of Patents and Trademarks):

☒ Issue Fee
☒ Advance Order - # of Copies 10 + 30

4b. The following fees or deficiency in these fees should be charged to:

DEPOSIT ACCOUNT NUMBER
 (ENCLOSE AN EXTRA COPY OF THIS FORM)

☐ Issue Fee
☐ Advance Order - # of Copies

The COMMISSIONER OF PATENTS AND TRADEMARKS IS requested to apply the Issue Fee to the application identified above.

(Authorized Signature) Martin Pfeffer (Date) 6/24/99
 Reg. No.: 20,808

NOTE: The Issue Fee will not be accepted from anyone other than the applicant, a registered attorney or agent, or the assignee or other party in interest as shown by the records of the Patent and Trademark Office.

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending on the needs of the individual case. Any comments on the amount of time required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND FEES AND THIS FORM TO: Box Issue Fee, Assistant Commissioner for Patents, Washington, D.C. 20231

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06/29/1999 STEFERR1 00000078 09161138

01 FC:142
 02 FC:561

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 30.00 00

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JUN 29 1999

Publishing Division

TRANSMIT THIS FORM WITH FEE

Patent Number: 05972168

TEXT ABSTRACT

0001 +pg,1

0002 +sa

0003 In a twin-wire former for the production of a paper

0004 web, two wire belts (+b 11 +1 and +b 12+1) together form a twin-wire <<<<

>>>>zone

0005 which is divided into three sections (I, II and III). In the

0006 first section (I) the two wires (+b 11, 12+1) travel over a curved

0007 forming shoe (+b 16+1). They form there a wedge-shaped inlet slot <<<<

>>>>(+b 15+1)

0008 with which a headbox (+b 10+1) is directly associated. In the second

0009 section (II), several resiliently supported strips (+b 27+1) rest

0010 against the lower wire (+b 11+1) and between each of said strips (+b <<<<

>>>>27+1)

0011 a rigidly mounted strip (+b 28+1) rests against the upper wire (+b <<<<

>>>>12+1).

0012 In the third section (III) both wire belts (+b 11, 12+1) pass over

0013 another curved forming shoe (+b 23+1).

0014 +ea

C of C
P/3312-15

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of
Dieter Egelhof et al.

Patent No.: 5,972,168

Serial No.: 09/161,138

For: TWIN WIRE FORMER



Date: December 1, 1999

Issued: October 26, 1999

Filed: September 25, 1998

4m.w.

11

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

**REQUEST FOR CERTIFICATE OF CORRECTION
UNDER 35 U.S.C. §254 AND 37 C.F.R. §1.322**

RECEIVED
DEC 21 1999
CERTIFICATES OF CORRECTION

Sir:

Submitted herewith is a PTO-1050 Certificate of Correction requesting that the following corrections be made to the above noted patent.

The first name of the 7th inventor's legal representative should be changed to Else instead of Elsie. The priority data is missing from the patent. The priority data is as follows: August 22, 1989 [DE] Germany P 39 27 597.3. The date of the PCT application which this application is based on is incorrect. The correct date should read August 9, 1990 instead of September 8, 1990.

A copy of the Declaration showing the above is attached.

As these errors are the fault of the Patent and Trademark Office, no fee is included with this request.

In the event that a fee is due, the Commissioner is authorized to charge any fees related to the issuance of the Certificate of Correction to Deposit Account No. 15-0700.

APPROVED

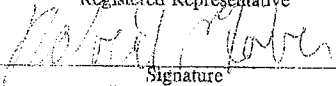
MAY 3 2000

FOR THE COMMISSIONER OF PAT. & TM.

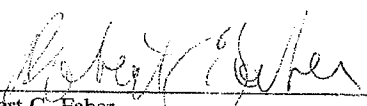
P/132-18

In view of the foregoing, early issuance of the Certificate of Correction is earnestly solicited.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Hon. Commissioner of Patents and Trademarks, Washington, D.C. 20231, on December 1, 1999:

Robert C. Faber
_____ Name of applicant, assignee or Registered Representative

_____ Signature
December 1, 1999
_____ Date of Signature

Respectfully submitted,



Robert C. Faber
Registration No.: 24,322
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 Avenue of the Americas
New York, New York 10036-8403
Telephone: (212) 382-0700

RCF:ahc
Enclosure



UNITED STATES OF AMERICA
COMBINED DECLARATION AND POWER OF ATTORNEY
FOR CONTINUING APPLICATION

CPGS FILE NO.
P/14-363

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

TWIN WIRE FORMER

the specification of which

☐ is attached hereto.

My was filed on 11/02/95 as United States Patent Application Serial No. 08/556,769

☐ was filed on _____ as PCT International Application No. _____

and was entered on 02/07/96 (if any).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by the amendments referred to above.

I acknowledge my duty to disclose all information known to be material to patentability, pursuant to Title 35, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119
Germany	P 39 27 597.3	08/22/89	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

07/773,965 (Application Serial No.)	November 12, 1991 (Filing Date)	Abandoned (Status)
08/286,948 (Application Serial No.)	August 8, 1994 (Filing Date)	Pending (Status)
08/055,918 (Application Serial No.)	April 29, 1993 (Filing Date)	Issued (Status)

As to the application issuer which I claim benefit under Title 35, United States Code, §120, I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119
Germany	P 39 27 597.3	08/22/89	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No

CONTINUED ON PAGE 2

CPGS FORM DE1 (92)

PAGE 2

UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR CONTINUING APPLICATION		CPGS FILE NO. P/14-363
<p>I hereby appoint OSTROLENK, FABER, GERS & SOFFEN and the members of the Firm, Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Berliner—Reg. No. 18,653; Robert C. Faber—Reg. No. 24,322; Edward A. Medman—Reg. No. 24,735; Stanley H. Lieberstein—Reg. No. 22,400; Steven L. Weisburd—Reg. No. 27,409; Max Moskowitz—Reg. No. 30,576; Stephen A. Soffen—Reg. No. 31,061; and James A. Fander—Reg. No. 30,171, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.</p> <p>SEND CORRESPONDENCE TO:</p> <p style="text-align: center;">OSTROLENK, FABER, GERS & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NEW YORK 10036-8403 DIRECT TELEPHONE CALLS TO: (212) 382-0700</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>		
Full name of Sole or First Inventor Dieter Egelhof	Inventor's Signature <i>Dieter Egelhof</i>	Date MAY 23, 1996
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Lucas-Cranach-Str. 15, D-7920 Heidenheim, Germany		
Full name of Second Joint Inventor Klaus Henseler	Inventor's Signature <i>Klaus Henseler</i>	Date 24.05.96
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Wildstr. 20, D-7920 Heidenheim, Germany		
Full name of Third Joint Inventor Werner Kade	Inventor's Signature <i>Werner Kade</i>	Date 28.5.96
Residence Neenah, Wisconsin 54956	Country of Citizenship Germany	
Post Office Address 521 Harbor Light Court, Neenah, Wisconsin 54956, USA		
Full name of Fourth Joint Inventor Albrecht Meinecke	Inventor's Signature <i>Albrecht Meinecke</i>	Date 28.5.96
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Hans-Rolbein-Str. 39, D-7920 Heidenheim, Germany		
Full name of Fifth Joint Inventor Wilhelm Wanke	Inventor's Signature <i>W. Wanke</i>	Date 26. May 1996
Residence D-7920 Heidenheim	Country of Citizenship Germany	
Post Office Address Donauschwabenstr. 47, D-7920 Heidenheim, Germany		

CONTINUED ON PAGE 3

CPGS FORM DEZ 790

Page 3

UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR CONTINUING APPLICATION		OFGS FILE NO. P/14-363
<p>I hereby appoint OSTROLENK, FABER, GERR & SOFFEN and the members of the Firm, Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Bariner—Reg. No. 18,653; Robert C. Faber—Reg. No. 24,122; Edward A. Meilman—Reg. No. 24,735; Stanley H. Lieberstein—Reg. No. 22,400; Steven L. Weisburd—Reg. No. 27,409; Max Moskowitz—Reg. No. 30,578; Stephen Soffen—Reg. No. 31,063; and James A. Funder—Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.</p> <p>SEND CORRESPONDENCE TO:</p> <p style="text-align: center;">OSTROLENK, FABER, GERR & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NEW YORK 10036-8403 DIRECT TELEPHONE CALLS TO: (212) 382-0700</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>		
<p>Full name of 6th Inventor FARS-Jurgen Wulz</p> <p>Residence D-7920 Heidenheim</p> <p>Post Office Address Inselstr. 11, D-7920 Heidenheim, Germany</p>	<p>Inventor's Signature <i>[Signature]</i></p> <p>Country of Citizenship Germany</p>	<p>Date 20. May 96</p>
<p>Full name of 7th Inventor Rudolf Bück *</p> <p>Residence D-7920 Heidenheim</p> <p>Post Office Address Schlossstr. 53, D-7920 Heidenheim, Germany</p>	<p>Inventor's Signature</p> <p>Country of Citizenship Germany</p>	<p>Date</p>
<p>BY HIS LEGAL REPRESENTATIVE</p> <p style="text-align: center;"><i>[Signature]</i> Mrs. Else Bück</p>		

* By his legal representative

Staple
Here
Only!

PRINTERS TRIM LINE

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 5,972,168
DATED : October 26, 1999
INVENTOR(S) : Egelhof et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Please correct the first name of the 7th inventor's legal representative as follows:

[75] Else Bück, legal representative

Please add the following missing priority data:

[30] **Foreign Application Priority Data**

August 22, 1989 [DE] Germany....P 39 27 597.3

Please correct the Related U.S. Application Data as follows:

[62] Continuation of application No. 09/023,435, Feb. 13, 1998, which is a continuation of application No. 08/556,769, Nov. 2, 1995, Pat. No. 5,718,805, which is a continuation of application No. 08/286,948, Aug. 8, 1994, Pat. No. 5,500,091, which is a continuation of application No. 08/055,918, April 29, 1993, Pat. No. 5,389,206, which is a continuation of application No. 07/773,965, Nov. 12, 1998, abandoned, filed as application No. PCT/EP90/01313, Aug. 9, 1990.

MAILING ADDRESS OF SENDER:

Robert C. Faber
Ostrolenk, Faber, Gerb & Soffen, LLP
1180 Avenue of the Americas
New York, NY 10036-8403

PATENT NO. 5,972,168

No. of add'l copies
@ 50¢ per page

APPROVED	O.G. FIG. 2
BY	CLASS SUBCLASS
162	203

5972168

09/16/138

Fig.1

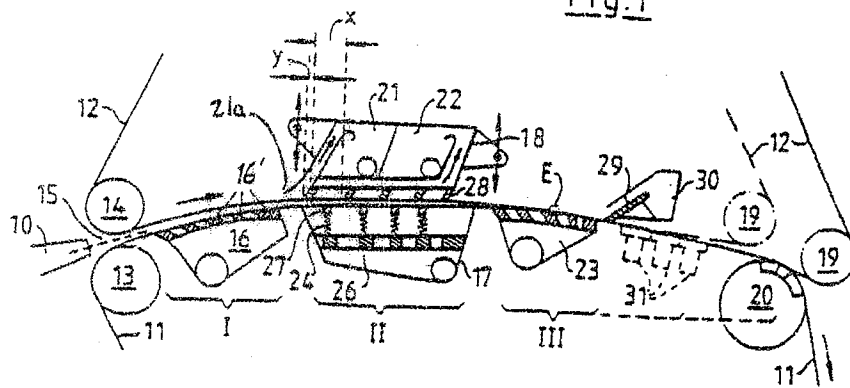


Fig.2

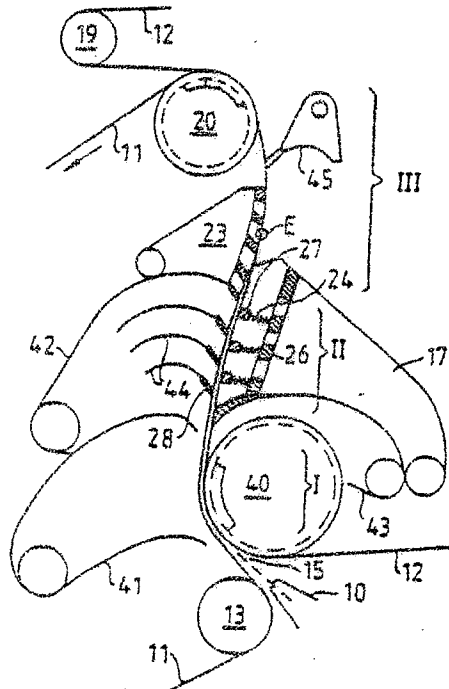
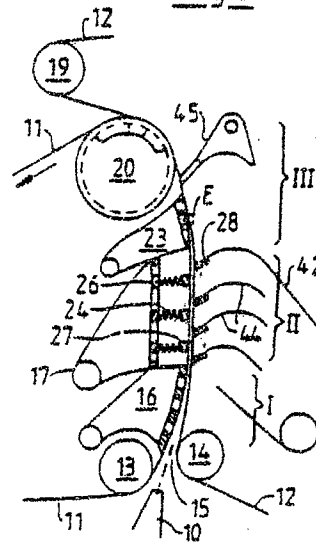


Fig.3



09161138-092598

APPROVED	O.G. FIG.	
BY	CLASS	SUBCLASS
DATE		

09/16/138

Fig.4

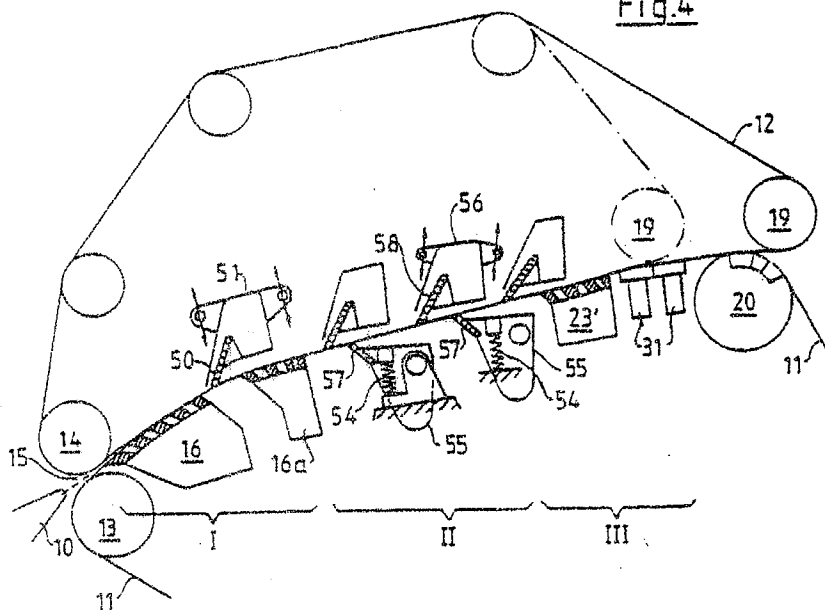
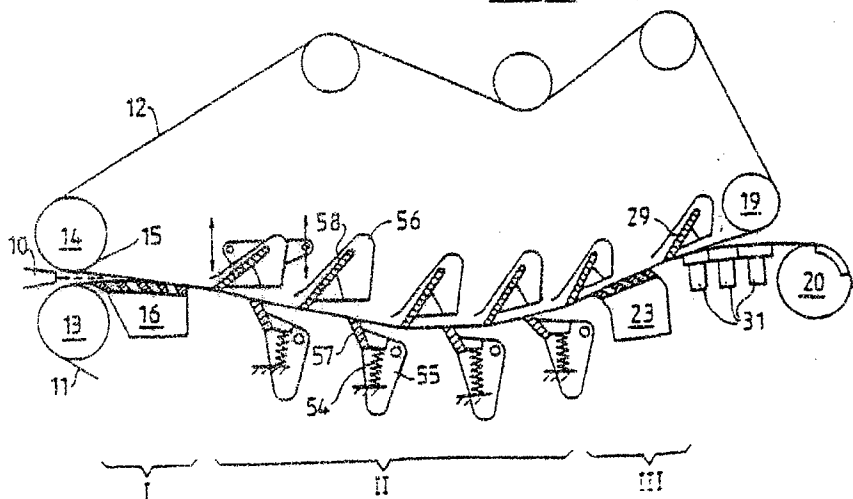


Fig.5



0916138-00226

Sheet 1 of 1

[illegible]

PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

10/09/1998 R0001100 00000000 09161128

01 FE:101
02 FE:102

796.00 00
82.00 00

PATENT APPLICATION FEE DETERMINATION RECORD					Application or Docket Number		
Effective October 1, 1997					09/16/138		
CLAIMS AS FILED - PART I							
(Column 1)		(Column 2)					
FOR	NUMBER FILED	NUMBER EXTRA					
BASIC FEE		[REDACTED]					
TOTAL CLAIMS		8	minus 20 = *				
INDEPENDENT CLAIMS		4	minus 3 = *		1		
MULTIPLE DEPENDENT CLAIM PRESENT							
* If the difference in column 1 is less than zero, enter "0" in column 2							
CLAIMS AS AMENDED - PART II							
(Column 1)		(Column 2)		(Column 3)			
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	[REDACTED]	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA			
	Total	*	Minus	**	=		
	Independent	*	Minus	***	=		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM						
	[REDACTED]						
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	[REDACTED]	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA			
	Total	*	Minus	**	=		
	Independent	*	Minus	***	=		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM						
	[REDACTED]						
AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	[REDACTED]	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA			
	Total	*	Minus	**	=		
	Independent	*	Minus	***	=		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM						
	[REDACTED]						
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" in THIS SPACE is less than 20, enter "20." *** If the "Highest Number Previously Paid For" in THIS SPACE is less than 3, enter "3." The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.							
SMALL ENTITY TYPE <input type="checkbox"/>				OR			
OTHER THAN SMALL ENTITY				OR			
RATE	FEE		RATE		FEE		
[REDACTED]		395.00		[REDACTED]		790.00	
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x41=		[REDACTED]		x82=		82	
+135=		[REDACTED]		+270=		[REDACTED]	
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OTHER THAN SMALL ENTITY				OR			
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x41=		[REDACTED]		x82=		[REDACTED]	
+135=		[REDACTED]		+270=		[REDACTED]	
TOTAL ADDIT. FEE		[REDACTED]		TOTAL ADDIT. FEE		[REDACTED]	

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET (FOR USE WITH FORM PTO-875)							SERIAL NO.	FILING DATE					
							APPLICANT(S)						
CLAIMS													
	AS FILED		AFTER 1st AMENDMENT		AFTER 2nd AMENDMENT			*		*		*	
	IND.	DEP.	IND.	DEP.	IND.	DEP.		IND.	DEP.	IND.	DEP.	IND.	DEP.
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50							100						
TOTAL IND.							TOTAL IND.						
TOTAL DEP.							TOTAL DEP.						
TOTAL CLAIMS							TOTAL CLAIMS						

* MAY BE USED FOR ADDITIONAL CLAIMS OR ADMENDMENTS

FORM PTO-1360 (REV. 3-78)

U.S. DEPARTMENT OF COMMERCE
Patent and Trademark Office

Exhibit 5

United States Patent [19]**Ebihara et al.**[11] **Patent Number:** 4,999,087[45] **Date of Patent:** Mar. 12, 1991[54] **TWIN WIRE FORMING APPARATUS WITH POSITIVE PRESSURE FOILS**[75] **Inventors:** Masafumi Ebihara, Mihara; Takeshi Akitomo, Hiroshima; Minoru Nomura, Tokyo, all of Japan[73] **Assignee:** Research Association for Pulp and Paper Technology, Tokyo, Japan[21] **Appl. No.:** 364,531[22] **Filed:** Jun. 12, 1989**Related U.S. Application Data**

[63] Continuation of Ser. No. 110,584, Oct. 19, 1987, abandoned, which is a continuation of Ser. No. 783,434, Oct. 3, 1985, abandoned.

[30] **Foreign Application Priority Data**

Oct. 3, 1984 [JP] Japan 59-207885

[51] **Int. Cl.⁵** D21F 1/00; D21F 1/54[52] **U.S. Cl.** 162/301; 162/300; 162/352[58] **Field of Search** 162/300, 301, 303, 348, 162/352**References Cited****U.S. PATENT DOCUMENTS**

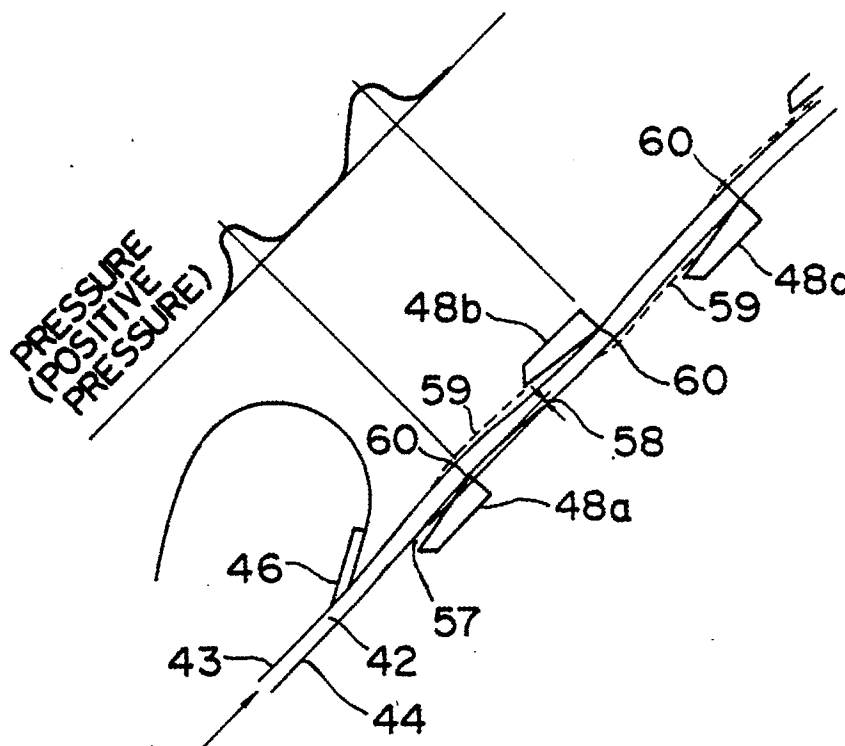
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4,306,934	12/1981	Seppanen	162/300
4,447,296	5/1984	Cruse	162/352

FOREIGN PATENT DOCUMENTS

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1075898	4/1986	Japan	162/348
1119796	6/1986	Japan	162/352

Primary Examiner—Karen M. Hastings[57] **ABSTRACT**

A paper web forming apparatus essentially comprising two wires which move together with stock which is held therebetween and a plurality of wire supporting members for supporting the wires, each of the wire supporting members forming a wedge-shaped space, as defined between the wire surface and the wire supporting member, wherein the wedge-shaped space is so designed that the width as measured therebetween decreases as seen in the direction of movement of the wires.

2 Claims, 4 Drawing Sheets

U.S. Patent

Mar. 12, 1991

Sheet 1 of 4

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FIG. 1

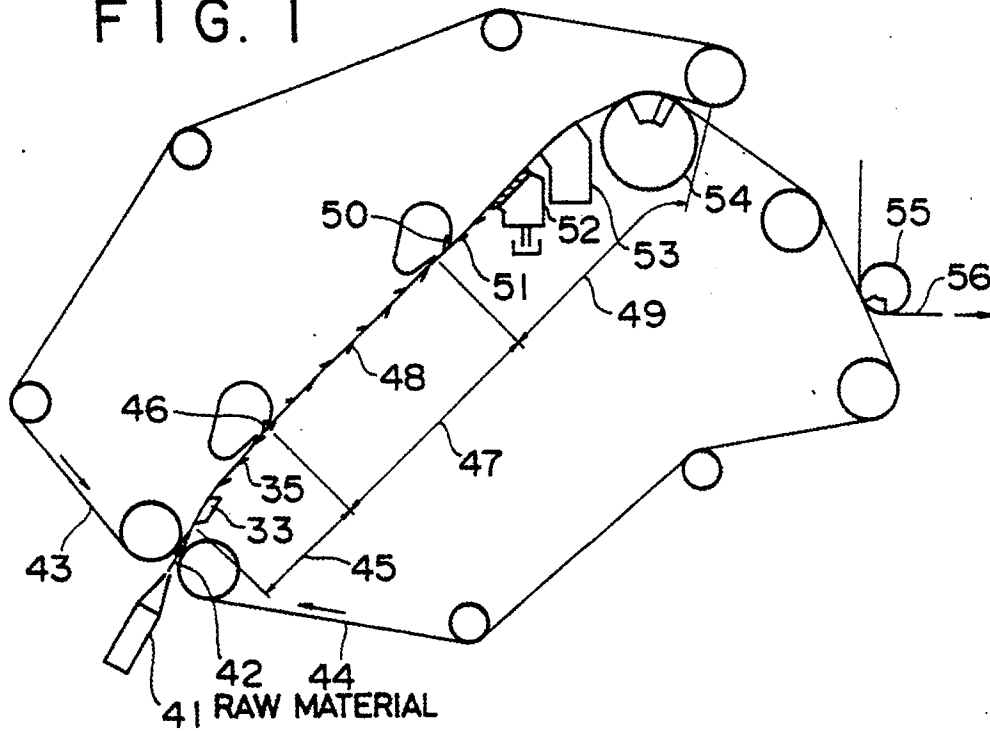
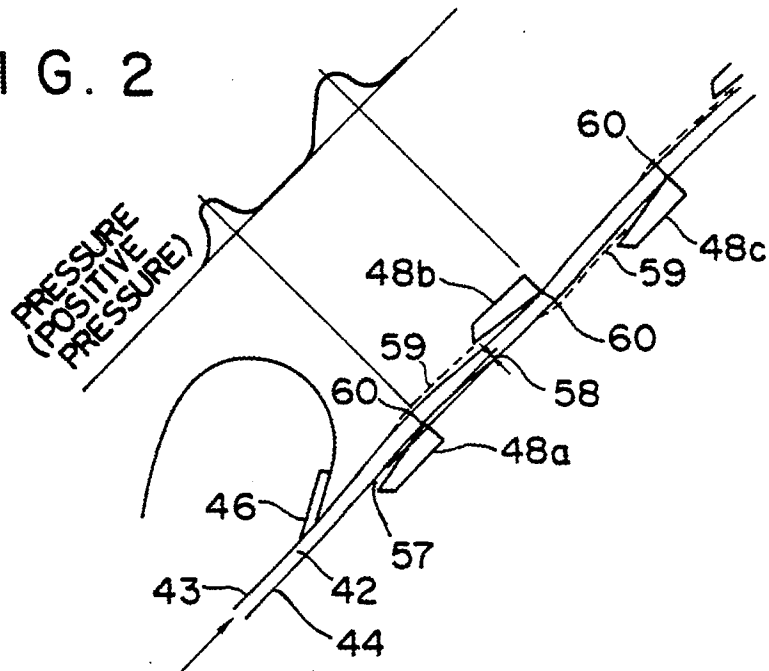


FIG. 2



U.S. Patent

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FIG. 3

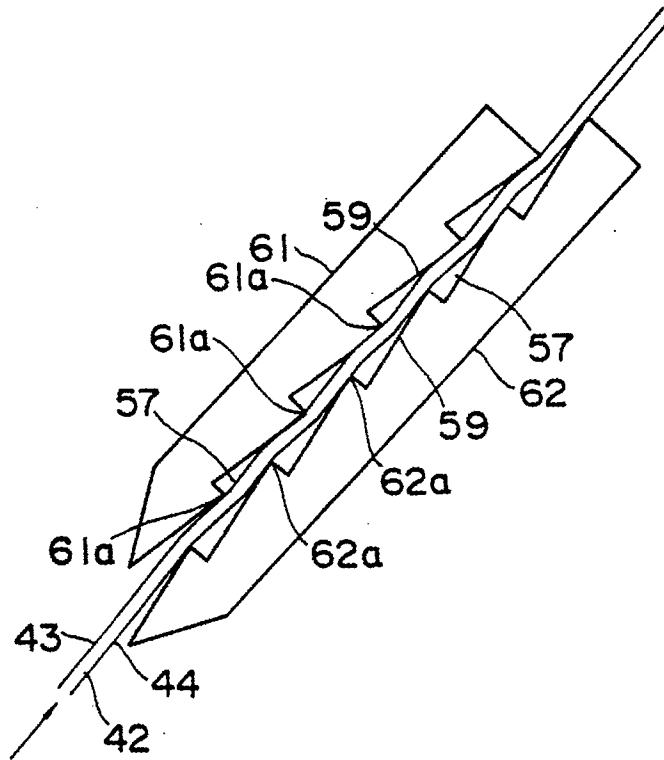
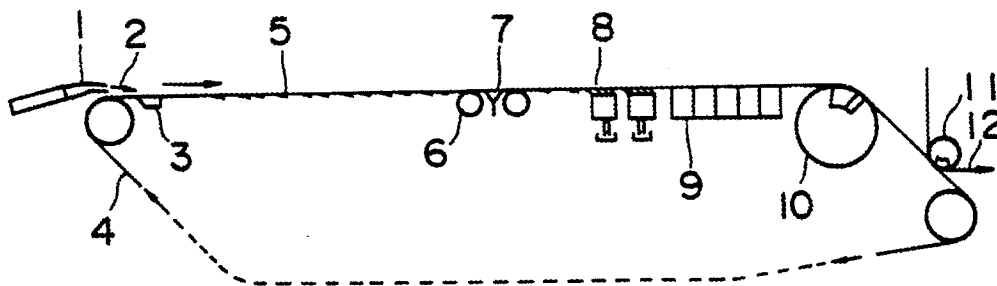


FIG. 4(PRIOR ART)



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Mar. 12, 1991

Sheet 3 of 4

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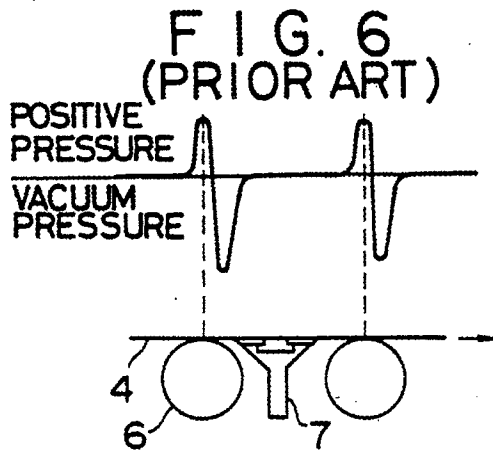
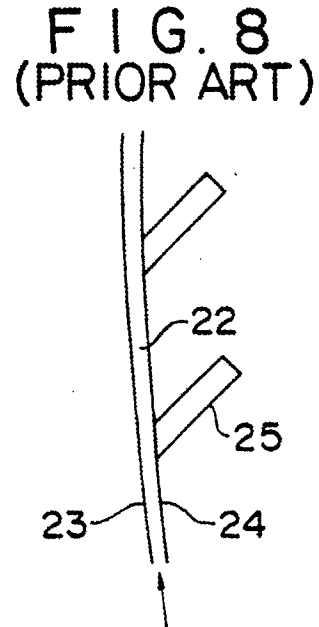
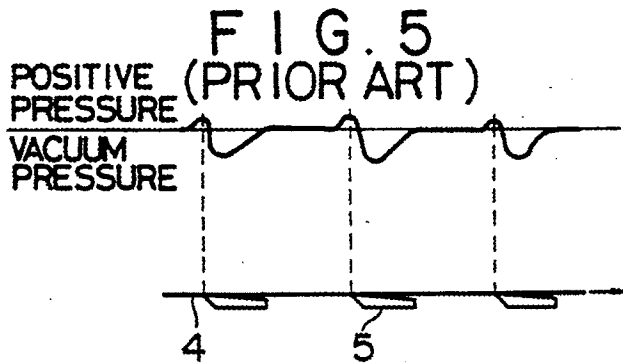
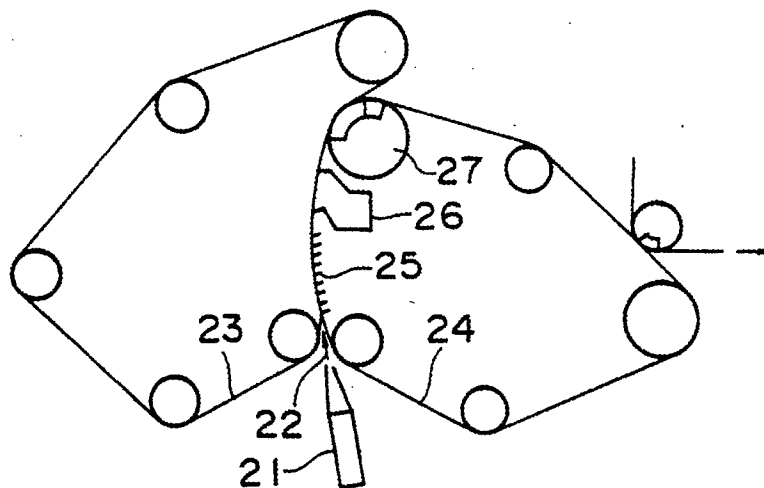


FIG. 7 (PRIOR ART)



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FIG. 9
(PRIOR ART)

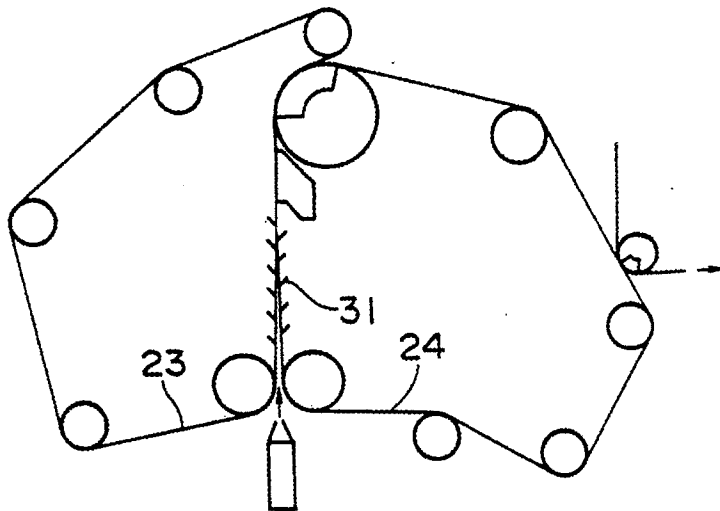


FIG. 10
(PRIOR ART)

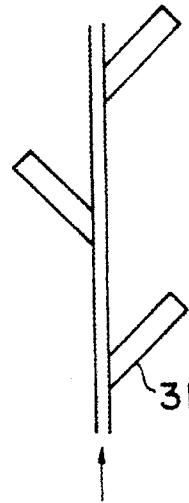
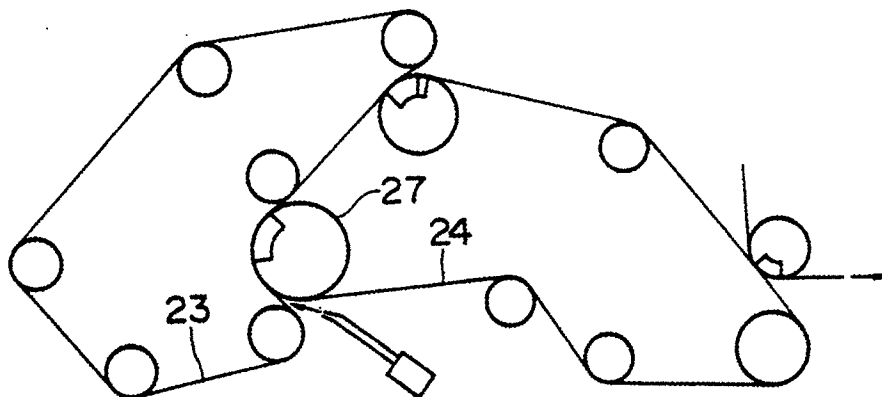


FIG. 11 (PRIOR ART)



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TWIN WIRE FORMING APPARATUS WITH POSITIVE PRESSURE FOILS

This application is a continuation, of application Ser. No. 07/110,584 filed on 10/19/87, now abandoned, which in turn was a continuation of application Ser. No. 783,434 filed 10/3/85, now abandoned.

BACKGROUND OF THE INVENTION

(i) Field of the Invention

The present invention relates to a paper web forming apparatus and more particularly to a paper web forming apparatus of the type employable, for instance, for a double wire type wire part which is designed to include a section where two wires are adapted to move in the distance from a supporting roll to the next supporting roll while raw material (stock) is held therebetween and a single wire type wire part which is so designed that two wires can move in parallel with one another with the aid of top wire arranged additionally.

(ii) Description of the Prior Art

Wire parts of FOURDRINIER paper machines are generally classified into two types, that is, single wire type and double wire type. This FOURDRINIER paper machine is so constructed that raw material including fiber slurry and filler at a predetermined consistency is caused to uniformly disperse in a head box and thus uniformly dispersed stock material is quickly transferred to a wire part at which drainage is achieved to produce, a product in the form of paper web (wet paper). It appears that in said machine basic formation of the paper web (flock recognizable due to non-uniformity in entangling and distributing of fibers in paper web) is dependent on performance of the head box and an effect on the wire part is recognized only to the foremost part thereof at which dewatering is initiated. In practice, all the conventional wire parts are designed on the basis of the above-mentioned concept. Thus, wire part components or the like disposed for the purpose of better formation (dispersion of fibers) can not be looked for in the practical machine.

To facilitate understanding of the present invention it will be helpful that the typical wire types will be described below with reference to FIGS. 4 to 11.

First, FIG. 4 is a schematic side view illustrating an example of the single wire type. In the drawing reference numeral 1 designates a head box from which uniformly dispersed raw material 2 is injected. Thus injected raw material is then transferred on the wire 4 which are supported by means of a forming board 3. During movement of raw material on the wire in the direction as identified by an arrow mark in the drawing raw material is subjected to dewatering with the aid of a plurality of foils 5, table rolls 6, vacuum foil boxes 8, suction boxes 9 and a suction couch roll 10. A deflector 7 serves to scrape off white water which drained by means of the table rolls 6, while the wire is held in the horizontal posture.

Consistency of raw material is normally determined in the range of 0.5 to 1% at the outlet of the head box 1 and it increases to a level of 3 to 6% when raw material reaches the suction box 9. After it moves past the suction couch roll 10, it is dehydrated to a level of about 20% whereby it becomes a wet paper web. The produced wet paper web is taken out from and change the wires 4 under the effect of suction which is generated

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by means of a suction pickup roll 11 and it is then transferred on a felt 12.

FIG. 5 is an enlarged side view of the foils 5 which illustrates change of pressure exerted on raw material held on the wire 4 by the foils 5 and FIG. 6 is an enlarged side view of the table rolls 6 which illustrates change of pressure exerted on raw material held on the wire 4 varies by table rolls 6.

As is apparent from FIG. 4, the vacuum foil box 8 is so constructed that a plurality of foils are arranged one after another on the upper surface of the box which is evacuated to a level of comparatively low vacuum whereby dewatering enhanced. The suction box 9 is so designed that a perforated plates with a number of elongated holes or round holes formed thereon in plural rows are placed on the upper surface of the box whereby forcible dewatering is achieved under a high intensity of vacuum atmosphere. Next, the suction couch roll 10 is so designed that a suction box is disposed inside the perforated cell whereby powerful dewatering is achieved.

FIG. 7 is a schematic side view of an example of the double wire type that is so called gap type and FIG. 8 is a fragmental side view of the apparatus in FIG. 7, shown in an enlarged scale. Raw material 22 is injected from the head box 21 and it is then caused to move upwardly while it is clamped between both of the wires 23 and 24. Dewatering is achieved under the effect of pressure which is generated by means of a plurality of forming shoes 25 in the presence of wire tension and white water which appears as a result of dewatering is removed by scraping operation of the forming shoes 25 on the inside of the apparatus as well as by centrifugal force on the outside of the same. Thus dewatered raw material is transferred to the felt via the suction box 26 having the curved perforated plates and the suction couch roll 27.

FIG. 9 is a schematic side view illustrating another example of the gap system double wire type and FIG. 10 is a fragmental side view of the apparatus in FIG. 9, shown in an enlarged scale. In the illustrated example a plurality of dewatering blades 31 are alternately arranged on both the sides of the wires.

FIG. 11 is a schematic side view illustrating an example of the double wire type that is so called roll type. In the illustrated example raw material is dewatered under the effect of pressure which is generated by tension of the wires partially wound about the suction roll 27 as well as suction force which is generated by means of the suction roll. Incidentally, in some case the roll is designed in the solid structure. In addition to this various types are practically employed but basic concept is based on a combination of the above-mentioned types or its modification or improvement.

Description will be made below as to devices and components used for the wire part to have an effect on raw material (hereinafter referred to simply as components), excluding the forming board and the deflector. Naturally, each of the components is designed and constructed for the purpose of carrying out dewatering under the influence of vacuum or pressure in such a manner that their foremost end comes in contact with the wires with the exception of rolls.

Among the above-mentioned components the forming board 3, the table rolls 6 and the foils 5 are helpful for the purpose to improve formation of the paper web when they are used with reduced dewatering force, as long as consistency of raw material is not so rich com-

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pared with that in the head box (normally in the range of 0.5 to 1%). The manner of utilizing them is determined in accordance with the extent that the wire part for which they are in use exhibits its inherent performances and therefore it has very few effect on production of paper. With respect to the double wire type it is found that relatively good formation is achieved compared with the single wire type. However, even in the case of the double wire type the formation becomes deteriorated as consistency increases. For this reason, any practical paper making machine is operated under the operative condition relative to consistency of fibers not in excess of 1%.

The essential reason why no improved formation can be obtained by means of the wire part and thereby consistency of raw material in the head box can not be increased consists in function of dewatering as mentioned below which is carried out by means of the components supporting the wires while raw material moves together with the wires. As is well known, raw material held on the wire or between the two is subjected to dewatering as it moves, resulting in increased consistency and reduced fluidity. Raw material located in the area in the vicinity of the wire surface is increasingly concentrated under the influence of dewatering until a fiber mat is formed. Although the components serve to support the wire function to disperse the raw material, they fail to do so as fluidity of raw material decreases. As a result, only little accumulation of dispersion effect can be expected with them.

Further, when function other than dewatering is imparted to raw material at the step where forming of fiber mat proceeds, there is a danger of damaging or injuring the fiber mat which is being formed. In practice, it is reported that the paper web having bad formation with grain-shaped flock extended over the whole area of the product is produced when the machine is operated under the condition of comparatively high consistency (in the range of 1 to 1.5%) in accordance with the double wire type while the components constituting the wire part are adjusted to exhibit a high intensity of function thereof. In this case such a pattern that thus produced fiber mat is torn in pieces is recognized with respect to the flock appearing on the fiber mat.

In view of the above-mentioned facts it is generally considered that characterizing features of formation dependent on the structure of the wire part to some extent but formation is fundamentally determined by performance of the head box without remarkable improvement in the area of the wire part.

To obviate the foregoing problem consistency of raw material particularly in the head box may be raised up to a higher level, for instance, in the range of 2 to 3%. This level of consistency of raw material corresponds to consistency of the same as measured at the position located before the suction box or that as measured at the position located in the proximity of the suction box, when the single wire type is employed for the machine. This means that dispersion function to be achieved for raw material in the area just before the suction box is dependent only on dispersion function which is achieved in the head box. However, since raw material having a higher consistency as mentioned above has a high level of viscosity compared with raw material having a consistency lower than 1% and moreover repeated flocking (representing such a state that fibers become granular due to an occurrence of entangling) lasts for a very short period of time (for instance, on the

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order of 1/100 second), it is difficult to develop a head box which can maintain dispersion of raw material properly until the latter is processed to a product in the form of paper and this is the reason why raw material having a higher level of concentration can not be used.

SUMMARY OF THE INVENTION

Hence, the present invention has been made with the foregoing background in mind and its object resides in providing a paper web forming apparatus which assures that dispersion capability of the wire part is remarkably improved to such an extent that can not be expected with the conventional apparatus and moreover it can be properly operated at a consistency of raw material in the range of 3 to 4% in the head box.

To accomplish the above object there is proposed according to the invention a paper forming apparatus comprising two wires adapted to move together with raw material which is held therebetween and wire supporting members for supporting the wires at the both sides of the wires, each of the wire supporting members forming a wedge-shaped space as defined between the wire surface and the wire supporting member, wherein the wedge-shaped space is so formed that the width as measured therebetween decreases as seen in the direction of movement of the wires.

In a preferred embodiment of the invention raw material which has moved into the formation improving zone and the two wires are pushed in relative to the wire line by a very short distance in the area where the wire supporting members come in contact with the wires. Pressure is generated in raw material held between the two wires under the effect of the above-mentioned pushing-in and wire tension and thereby white water is oozed out of raw material so as to allow the wires to become wetted with white water. After the surface of the wire supporting members is wetted with the oozed white water, the latter is caused to flow back into the raw material by the action of the wedge-shaped space and it is then oozed out of raw material on the opposite side to move further together with the wires.

Said oozed out actions are carried out alternately, in the number of plural times, to the raw material from both sides of the wires by the wire supporting members.

Thus, the better formation is formed, by the high frequent vibration which is added the raw material held between the two wires by the white water passed through the wires.

Other objects, features and advantages of the invention will become readily apparent from reading of the following description which has been prepared in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings will be briefly described below.

FIG. 1 is a sectional side view of a paper web forming apparatus in accordance with an embodiment of the invention.

FIG. 2 is a fragmental side view of the apparatus in FIG. 2, shown in an enlarged scale.

FIG. 3 is a fragmental sectional side view of a paper web forming apparatus in accordance with another embodiment of the invention, illustrating an essential part of the apparatus in an enlarged scale.

FIG. 4 is a sectional side view of the conventional single wire type wire part.

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FIG. 5 is a fragmental enlarged side view of the apparatus in FIG. 4, particularly illustrating change of pressure exerted on raw material by foils.

FIG. 6 is a fragmental enlarged side view of the apparatus in FIG. 4, particularly illustrating change of pressure exerted on the raw material by the table rolls.

FIG. 7 is a sectional side view of the conventional double wire type wire part.

FIG. 8 is a fragmental side view of the apparatus in FIG. 7, particularly illustrating the structure of an essential part of the apparatus in an enlarged scale.

FIG. 9 is a sectional side view of the conventional gap system double wire type wire part.

FIG. 10 is a fragmental side view of the apparatus in FIG. 9, particularly illustrating the structure of an essential part of the apparatus in an enlarged scale, and

FIG. 11 is a sectional side view of the conventional roll system double wire type wire part.

DETAILED DESCRIPTION OF THE INVENTION

Now, the present invention will be described in a greater detail hereunder with reference to the accompanying drawings which illustrate preferred embodiments thereof.

FIGS. 1 to 3 schematically illustrate an embodiment of the invention, wherein FIG. 1 is a schematic side view of a wire part including formation improving zone according to the invention, FIG. 2 is a schematic side view of the formation improving zone in FIG. 1, shown in an enlarged scale and FIG. 3 is a fragmental schematic side view of a modified embodiment of the invention in which each side including a plurality of forming foil is designed in the integrated structure.

Referring to the drawing, raw material 42 injected from the head box 41 is introduced into the space as defined between two wires 43 and 44 and thereafter it passes through an initial dewatering zone 45 which comprises a forming board 33, a plurality of foils 35 having reduced dewatering function and a deflector 46 located opposite to the foils 35 for the purpose of scraping white water which is oozed out of the layer of raw material toward the opposite side relative to the foils 35 so as to allow raw material to assume the stable and uniform state between the two wires. Thus, raw material reaches the forming improving zone 47. When raw material has a very low consistency, it is preferable that it is dewatered to a certain acceptable level of consistency in the initial dewatering zone 45.

Specifically, the formation improving zone 47 is constituted by a plurality of formation foil 48 which serve as a series of wire supporting members in the both sides of wires. As is apparent from the drawing, the formation foil 48 are arranged at a predetermined inclination angle relative to the moving wires 43 on 44 in such a manner that their rear ends come in contact with the wires 43 on 44 to support the latter. Thus, a wedge-shaped space 57 having an apex at the contact point 60 is built in the area as defined between the formation foil 48 and each of the wires 43 and 44. Namely, this is the case where arrangement is so made in the reverse direction that the foremost ends of the conventional wire part components (excluding rolls) come in contact with the wires (see FIGS. 5, 8 and 10).

The reason why the foremost end of the conventional formation foil wire part component is adapted to come in contact with the wires is that white water oozed out from raw material through the adjacent wires under the

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effect of function and gravity of the preceding wire support component or the like means is scraped while inhibiting it from permeating into raw material again accompanied by adverse effect on mat formation, and moreover dewatering is achieved effectively. Must particular care is taken on the geometrical configuration of the foremost end part of the wire part component.

In the embodiment as illustrated in FIGS. 1 and 2 the formation foils 48 are alternately arranged on both sides but the present invention should not be limited only to such alternate arrangement as mentioned above. Namely it is possible to arrange alternately on every two or more formation foils on both the sides. Further, the present invention should not be limited to moving of the wires in the oblique direction. Alternatively, the wires may move in the vertical or horizontal directions. Further, the contour of lines of the wires in the formation improving zone 47 may be generally scribed in the circular shape.

After passing through the formation improving zone 47, raw material is dewatered in a dewatering section 49 quickly which is located behind the formation improving section 47 for the purpose of mat forming whereby fiber mat (wet web) is formed quickly in the dewatering zone 49. This dewatering zone 49 comprises a deflector 50, a plurality of foil 51, a foil box 52, a suction box 53 and a suction couch roll 54. However, the present invention should not be limited only to the arrangement as mentioned above. Decision may be properly made in consideration of paper making conditions as to what components among the above-mentioned ones should be employed. It should be noted that raw material which has moved over the suction couch roll 54 assumes such a wet web having substantially the same consistency of about 20% as that in the conventional wire part and it is then transferred to a felt 56 under the effect of suction effected by means of a suction pickup roll 55.

FIG. 3 is a fragmental schematic side view of the paper web forming apparatus which is constructed in the different manner from the embodiment as illustrated in FIGS. 1 and 2. The apparatus includes wire supporting members 61 and 62 which are formed with a plurality of projections 61a and 62a adapted to support the wires 43 and 44 with raw material 42 interposed therebetween and a set of wedge-shaped spaces 57 is formed in the area as defined between each of the wire supporting members 61 and 62 and each of the wires 43 and 44 with an apex being located at each of the projections 61a and 62a.

Referring to FIGS. 1 and 2 again, raw material and two wires 43 and 44 which have moved to the formation improving zone 47 via the initial dewatering section 45 is first subjected to function of the first formation foil 48a. As will be well seen in FIG. 2, the formation foil 48a is pushed into raw material by a very short distance 58 relative to the wire line. Thus, raw material 42 is affected by pressure which is generated by the above-mentioned pushing-in and wire tension while it is clamped between the wires 43 and 44 whereby white water is oozed out of raw material 42, resulting in the wires 43 and 44 becoming wetted with white water (dewatering is achieved).

Once white water is oozed out of raw material on the formation foil side, the surface of the formation foil 48a becomes wetted with white water and at the same time the latter is forcibly caused to flow back toward raw material under the effect of the wedge-shaped space 57.

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Thereafter, white water as identified by reference numeral 59 permeates through raw material with the aid of function of the formation foil until it is oozed out of raw material on the opposite wire surface (dewatering is achieved). Then, it moves further together with the wires 43 and 44.

Next, white water 59 is received in the wedge-shaped space as defined by the second formation foil 48b and it is then oozed out of raw material on the opposite wire surface in the same manner as in the area of the first formation foil. Then, raw material, white water and wires move toward the third formation foil 48c.

It should be noted that difference between the first formation foil and the second and other ones is such that pressure is generated in the slightly different manner when raw material moves past them. Namely, in the case of the first formation foil pressure increase is initiated just before the wires come in contact with the formation foil. On the other hand, in the case of the second and other formation foils pressure increase is initiated at time when the surface of the formation foil becomes wetted with white water having a certain thickness after it is oozed out of the wire surface by a preceding foil. This means that pressure increase is achieved at a comparatively slow rate with elongated working time and reduced shock. For the reason a volume of displacement of water increases but displacement of filler or the like material is inhibited under the effect of resistance developed by existence of fibers.

Since the formation improving zone 47 is constituted in the above-described manner, there is no fear of increasing consistency of the whole raw material containing white water therein due to flowing-out oozed water. Thus, fluidity of raw material is not lost and therefore the same function as in the second formation foil can be repeated by a required number of times.

On the other hand, raw material (fibrous material) clamped between both the wires 43 and 44 is caused to vibrate at a considerably high frequency under the influence of pressure and the flowing of white water which are generated by the formation foils 48. However but an extent of vibratory movement of raw material is limited by a close clearance between the adjacent wires which is defined by basis weight and a close clearance between the product and consistency of raw material.

A major part of white water flows in the direction at a substantially right angle relative to the wire surface but it is considered that there is existent a flow in the direction of movement of the wires as seen from the viewpoint of microscopical observation. Accordingly, dispersion of raw material is achieved in the direction of extension of the wire surface, that is, in such a direction that fibers expand in the direction of plane of paper. Since effect of dispersion achieved in that way increases accumulatively as a number of steps of movement increases, it is assured that raw material which is well dispersed in the direction of extension of plane and can not be obtained by means of any conventional wire part is prepared.

Thickness of raw material held between two wires and consistency of raw material pitch of formation foil, inclination angle and spacial volume of wedge-shaped space, depth of pushing-in of formation foil, wire tension and wire speed can be noted as factor which has an effect of function of dispersion in the formation improving zone. Obviously, each of the above-noted factors can be easily adjusted and determined in dependence on operative conditions of the apparatus.

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Since formation of the paper with the aid of the conventional wire part is carried out in conjunction with dewatering as mentioned above, it is found that its effect is less recognizable and in some case it tends to have an adverse effect on fiber matt.

On the contrary, the apparatus of the invention is so operated that dispersion of raw material is repeatedly carried out while maintaining fluidity of the same, resulting in remarkably improved effect of dispersion assured. Thus, a sample produced by operating a testing machine with the apparatus of the invention mounted thereon exhibits the same or better formation compared with that of commercial fine paper which was made up by raw material having a consistency of lower than 1% (printing paper) when raw material held in the head box has a consistency of 1.4%. Even when raw material has a consistency higher than 3%, a sample produced in that way exhibits that residual flock has a very faint and soft feeling with excellent effect of dispersion recognized and therefor it does not have such a formation as is seen when fiber mat is teared in pieces with the conventional wire part for which raw material has an increased consistency. Naturally, this effect can be expected even in the case when raw material has a consistency lower than the above-mentioned one.

Further, since the apparatus of the invention is so constructed that water constituting a major part of raw material is caused to alternately move in the transverse direction at a right angle relative to the wire surface while it is exerted on both the sides of raw material which is held between two wires. This leads to an advantageous feature of the invention that a product in the form of paper has excellent uniformity in the distribution of short fiber and filler as seen in the direction of thickness of the product. Since fibers are distributed in the direction of extension of plane of paper in the apparatus of the invention, it is assured that thus produced paper has excellently high strength as seen in the direction of extension of plane of paper even when the apparatus is operated using raw material having high consistency. As a result, the apparatus of the invention is free from such a significant drawback due to extremely reduced paper strength as is seen with the conventional apparatus in which raw material having high consistency is used.

According to the invention operative function to be imparted to raw material is gradually transmitted to raw material by way of white water which is retained in the wedge-shaped space and thereafter it is exerted on the contact area of the rearend where the wires are supported. This leads to other advantageous feature of the invention that reduced shock is imparted to raw material for a long period of operative time. Further, when raw material dispersed in the formation improving zone is dewatered to predetermined consistency in the area located behind, there is no necessity for imparting a high intensity of pulse force to raw material for the purpose of improving formation and what is to be done is only dewater quickly. As a result, an improved yielding rate of raw material and filler is assured.

According to the invention white water oozed out of raw material into the wedge-shaped space is caused to enter the wire supporting area whereby it functions as lubricating oil. As a result, frictional resistance appearing between the wires and the wire supporting members and wearing of the latter due to friction can be reduced and a running life of the wires can be elongated remarkably. Since an amount of scattered white water can be

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reduced remarkably compared with the conventional double wire system, mist ventilators are required very few and moreover white water can be easily treated. Thus, the apparatus of the invention can be operated under clean atmosphere.

While the present invention has been described above only with respect to a few preferred embodiments thereof, it should of course be understood that it should not be limited only to them but various changes or modifications may be made in any acceptable manner without departure from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. A paper web forming apparatus comprising:

a pair of sheets of wires which are substantially parallel to each other and which define a wire line moving together with stock held therebetween in a substantially spaced relationship; and

a plurality of wire supporting members for supporting said wires, said wire supporting members each having a front end and a rear end defining an inner surface facing said wires, said inner surface being substantially free of holes, bumps or dips, said wire supporting members contacting said wires at said rear end thereof at an angle with said wires forming wedge-shaped spaces between said inner surface of said support members and said wires, said wires otherwise being free of contact with said supporting members, said wedge-shaped spaces narrowing in the direction of the movement of said wires forming an apex where said support members contact said wires;

said wedge-shaped spaces formed by said inner surface of said support members and said wires receiving white water oozed from said stock and pushing said white water back into said stock;

said wire supporting members being alternately disposed on both sides of said sheets of wires and having said rear ends pushed in for a distance relative to said wire line, said distance being a distance such that said rear ends are pushed toward the wires such that said members alternately push or

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direct said white water oozed into said wedge-shaped spaces back into said stock, said supporting members each having a side downstream of the wire contacting rear ends thereof which side is generally perpendicular to the pair of sheets of wires,

whereby, along with movement of said sheets of said wires, said stock held therebetween is compressed by said support members and by wire tension so as to repeatedly ooze said white water to wet the wires, said white water thus oozed being pushed back into said stock by action of said wedge-shaped spaces thereby obtaining a high quality formation web by wavering said stock held between said sheets of wires.

2. A paper web forming apparatus comprising:

a pair of substantially parallel wires moving together with stock held therebetween; and

a pair of wire supporting members each having a plurality of projections adapted to support said wires and arranged to be pushed in against said wires, said wire supporting members each forming a plurality of wedge-shaped recesses defined as areas between said wire supporting members and said wires such that the pair of wires only engage the wire supporting members at the projections thereof and said pair of wires move along a zigzag path, each projection being defined by an inclined first side of the respective wire supporting member facing the pair of wires and forming a portion of the respective wedge-shaped recess, and an upstream second side of the respective wire supporting member generally perpendicular to the pair of wires;

wherein each of said defined wedge-shaped recesses has an apex pointing toward a subsequent projection of said support member, and

wherein said wedge-shaped recesses of one wire support member are alternately disposed with respect to said wedge-shaped recesses of said other wire support member.

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Exhibit 6

19 BUNDESREPUBLIK
DEUTSCHLAND



DEUTSCHES
PATENTAMT

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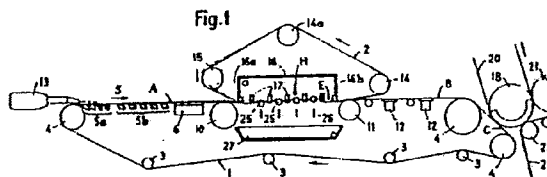
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Behördeneigentum

Prüfungsantrag gem. § 44 PatG ist gestellt

54 **Entwässerungseinheit für Langsieb-Papiermaschinen**

Die Entwässerungseinheit weist ein Langsieb (1) und ein zusätzliches Sieb (2) auf, welches entlang eines Abschnittes des Langsiebes geführt ist und mit diesem eine Entwässerungsstrecke (M) bildet. Im Bereich der Entwässerungsstrecke (M) sind die Siebe (1 und 2) über einen innerhalb der Siebschlaufe des zusätzlichen Siebes (2) angeordneten Saugkasten (16) geführt. Diesem sind mehrere, in der Siebschlaufe des Langsiebes (1) vorgesehene, über die Öffnung des Saugkastens (1) in Laufrichtung (Pfeil S) der beiden Siebe (1 und 2) hintereinander verteilt angeordnete Umlenkelemente (25) für die beiden Siebe (1 und 2) zugeordnet. Die Umlenkelemente (25) sind quer zur Öffnung des Saugkastens (16) einstellbar und gegebenenfalls zwischen in der Öffnung des Saugkastens (16) vorgesehene, parallele Führungsteile (17) für die beiden Siebe (1 und 2) einführbar. Dadurch wird eine vereinfachte Siebführung sowie – bei vorteilhaft geringer Abweichung vom ebenen Siebverlauf – durch je für sich einstellbare Flächenpressungen an den Umlenkelementen (25) auf kurzer Strecke eine besonders intensive Entwässerung des Papiervlieses erzielt. (31 38 133)



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Patentansprüche

1. Entwässerungseinheit für Langsieb-Papiermaschinen zur Entwässerung eines auf einem Langsieb (1) zugeführten, wasserhaltigen Papiervlieses, mit einem über Führungswalzen (14, 14a, 14b, 15) geführten zusätzlichen Sieb (2), welches entlang eines von einer Ebene (E) abweichend verlaufenden Abschnittes des Langsiebes (1) geführt ist und zusammen mit diesem eine Entwässerungsstrecke (M) bildet, dadurch gekennzeichnet, dass die beiden Siebe (1 und 2) im Bereich der Entwässerungsstrecke (M) über eine Öffnung eines innerhalb^{der} Siebschlaufe des zusätzlichen Siebes (2) angeordneten Gehäuses (16) geführt sind, welchem an der Seite des Langsiebes (1) vorgesehene, über die Öffnung des Gehäuses (16) in Laufrichtung (Pfeil S) der beiden Siebe (1 und 2) hintereinander verteilt angeordnete Umlenkelemente (25; 32a, 32b, 33; 38) für die beiden Siebe (1 und 2) zugeordnet sind, welche Umlenkelemente (25; 32a, 32b, 33; 38) quer zur Öffnung des Gehäuses (16) einstellbar sind.
2. Entwässerungseinheit nach Anspruch 1, dadurch gekennzeichnet, dass in der Öffnung des Gehäuses (16) mehrere parallel zu den Umlenkelementen (25; 32a, 32b, 33) der beiden Siebe (1 und 2) verlaufende, gegenüber diesen je in Laufrichtung (Pfeil S) der beiden Siebe (1 und 2) versetzt angeordnete Führungsteile (17) für die beiden Siebe (1 und 2) vorgesehen sind.
3. Entwässerungseinheit nach Anspruch 2, dadurch gekennzeichnet, dass mindestens einer der Führungsteile (17) in Richtung (Pfeil 28) quer zur Öffnung des Gehäuses

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(16) einstellbar ist.

4. Entwässerungseinheit nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, dass das Gehäuse (16) einer gegen den in Laufrichtung (Pfeil S) vor der Entwässerungsstrecke (M) liegenden, im wesentlichen ebenen Abschnitt (A) des Langsieves (1) geneigt verlaufenden Partie der beiden Siebe (1 und 2) zugeordnet ist.

5. Entwässerungseinheit nach Anspruch 4, dadurch gekennzeichnet, dass die beiden Siebe (1 und 2) über ein dem Gehäuse (16) in Laufrichtung (Pfeil S) der beiden Siebe (1 und 2) benachbartes Führungselement (14b) gegen eine am Ende der Entwässerungsstrecke (M) angeordnete Umlenkwalze (11, 14) geführt sind, an der sich die beiden Siebe (1 und 2) trennen.

6. Entwässerungseinheit nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, dass die Umlenkelemente (38) je in einer quer zur Oeffnung des Gehäuses (16) beweglichen Halterung (41) um eine quer zur Laufrichtung (Pfeil S) der beiden Siebe (1 und 2) verlaufende Achse (40) neigbar gelagert und je in einer einem vorbestimmten Verlauf der beiden Siebe (1 und 2) entsprechenden Winkelstellung einstellbar sind.

7. Entwässerungseinheit nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, dass die Umlenkelemente (38) innerhalb einer Schlaufe eines Endlosbandes (36) angeordnet sind, welches im Bereich der Entwässerungsstrecke (M) dem Langsieb (1) entlang geführt ist.

8. Entwässerungseinheit nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, dass die Umlenkelemente (38) je an ihrer der Laufrichtung (Pfeil S) der beiden Siebe (1 und 2) entgegengerichteten Seite eine gegen das

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Langsieb (1) fñhrbare Abstreifkante (39) aufweisen.

9. Entwässerungseinheit nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, dass das zusätzliche Sieb (2) über eine im Bereich der - in Laufrichtung

- 5 (Pfeil S) der beiden Siebe (1 und 2) betrachtet - vorderen Kante (Wand 16a) des Gehäuses (16) vorgesehene Führungsfläche mit dem Langsieb (1) zusammengeführt ist.

10. Entwässerungseinheit nach Anspruch 9, dadurch gekennzeichnet, dass die Führungsfläche an einem der vorderen

- 10 Wand (16a) des Gehäuses (16) zugeordneten Entwässerungselement (31) ausgebildet ist.

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P. 5649/Tq/Ma

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Entwässerungseinheit für Langsieb-Papiermaschinen

Die Erfindung betrifft eine Entwässerungseinheit für
Langsieb-Papiermaschinen zur Entwässerung eines auf einem
Langsieb zugeführten, wasserhaltigen Papiervlieses, mit
einem über Führungswalzen geführten zusätzlichen Sieb,
5 welches entlang eines von einer Ebene abweichend ver-
laufenden Abschnittes des Langsiebes geführt ist und zu-
sammen mit diesem eine Entwässerungsstrecke bildet.

Eine Papiermaschine dieser Art wurde in der schweizeri-
schen Patentanmeldung Nr. 87 46/80-9 bzw. der deutschen
10 Patentanmeldung P. 3100 713-9 vorgeschlagen (P.5560).
Bei der in dieser Anmeldung beschriebenen Langsieb-Pa-
piermaschine ist das vor und nach der Entwässerungsein-
heit im wesentlichen in der gleichen Siebebene verlaufende
Langsieb im Bereich der gemeinsamen Entwässerungsstrecke
15 zusammen mit dem zusätzlichen Sieb über einen auf der Höhe
der Siebebene angeordneten Entwässerungsschuh und eine
diesem in der Bewegungsrichtung der beiden Siebe nachge-
ordnete Entwässerungswalze aus der Siebebene nach unten
und anschliessend über eine unterhalb der Siebebene ver-

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laufende Lauffläche einer innerhalb der Siebschlaufe des
zusätzlichen Siebes angeordneten Umlenkwalze gegen die
Siebebene zurückgeführt, wo sich die beiden Siebe trennen.
Diese Anordnung vereinigt den Vorteil der einfachen

- 5 Konstruktion einer Langsiebmaschine mit den Vorteilen
der besonders intensiven Entwässerung und der verbesser-
ten Blattbildung einer Doppelsiebmaschine, wie sie z. B.
aus dem US-Patent 4 176 005 bekannt ist.

- Der Erfindung liegt die Aufgabe zugrunde in Weiterent-
10 wicklung der vorstehend beschriebenen Ausführung an einer
Papiermaschine der eingangs genannten Art eine weitere
Verbesserung der Entwässerungswirkung sowie eine weitere
konstruktive Vereinfachung der Siebführung und damit des
Maschinenaufbaus bei geringer Bauhöhe der Maschine zu
15 erzielen.

- Diese Aufgabe wird gemäss der Erfindung dadurch gelöst,
dass die beiden Siebe im Bereich der Entwässerungs-
strecke über eine Öffnung eines innerhalb der Siebschlaufe des zu-
sätzlichen Siebes angeordneten Gehäuses geführt sind,
20 welchem an der Seite des Langsiebes vorgesehene, über die
Öffnung des Gehäuses in Laufrichtung der beiden Siebe
hintereinander verteilt angeordnete Umlenkelemente für
die beiden Siebe zugeordnet sind, welche Umlenkelemente
quer zur Öffnung des Gehäuses einstellbar sind.

- 25 Die erfindungsgemässe Anordnung führt zu einer gegenüber
bisherigen Ausführungen noch einfacheren Konstruktion der
Maschine, wobei insbesondere auf den Einbau bisher er-
forderlicher, relativ voluminöser Entwässerungs- und Um-
lenkwalzen verzichtet wird. Durch die je für sich ent-
30 sprechend einer vorbestimmten Siebspannung im Bereich der
Entwässerungsstrecke einstellbaren Umlenkelemente ist - bei
weitgehend freier Führung der beiden Siebe in einer an-
nähernd ebenen oder zum Gehäuse konkaven

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- 3 - 6.

- Bahn - eine wesentliche, gegebenenfalls in Laufrichtung der beiden Siebe zunehmende Verstärkung der Intensität der Entwässerung auf vorteilhaft kurzer Strecke und bei vorteilhaft geringer Abweichung von einem üblicherweise angestrebten, geraden Siebverlauf erzielbar. Dabei ist die Intensität der Entwässerung praktisch ausschliesslich in Abhängigkeit von den durch die Umlenkelemente erzeugten, örtlichen Flächenpressungen, d. h. von der jeweils eingestellten Siebspannung steuerbar. Durch entsprechende örtliche Erhöhung der Siebspannung im Bereich der Umlenkelemente wird somit eine Art Förderwirkungerzielt, wobei in der Suspension ein Entwässerungsdruck aufgebaut werden kann, der grösser ist als der im Gehäuse wirkende statische Druck, so dass das bei der Entwässerung des Papiervlieses anfallende Wasser ohne Pulsation gegen die Gehäuseöffnung nach oben abtransportiert wird. Das Gehäuse ist dabei lediglich zur Entfernung des anfallenden Wassers bestimmt und kann daher entsprechend einfach ausgeführt werden. Insbesondere braucht ein allenfalls im Gehäuse zu erzeugender Unterdruck nicht etwa für die Bildung des Entwässerungsdruckes, sondern lediglich für die einen wesentlich geringeren Energieaufwand erfordernde Abfuhr des Wassers ausgelegt zu werden. Ein weiterer Vorteil der erfindungsgemässen Anordnung besteht in einer gegenüber bisherigen Anordnungen verbesserten Zugänglichkeit der die Entwässerungsstrecke durchlaufenden Siebe und der Umlenkelemente, da diese vorteilhaft klein gehalten werden können.

- In weiterer Ausgestaltung der Erfindung können in der Oeffnung des Gehäuses mehrere parallel zu den Umlenkelementen der beiden Siebe verlaufende, gegenüber diesen je in Laufrichtung der beiden Siebe versetzt angeordnete Führungsteile für die beiden Siebe vorgesehen sein.

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- 4 - 7.

- Diese Anordnung gestattet eine im wesentlichen wellenförmige Führung der beiden Siebe, welche durch auf relativ kurzer Strecke aufeinanderfolgende, jeweils in entgegengesetztem Sinne verlaufende Umlenkungen eine
- 5 örtlich leicht beeinflussbare Erhöhung der Siebspannung und damit eine gezielte Beeinflussung der Intensität des Entwässerungsvorganges ermöglicht. Dabei können die wellenförmigen Umlenkungen - bei entsprechender Einstellung der Führungsteile und Umlenkelemente - sowohl einer
- 10 ebenen oder konkaven als auch einer zum Gehäuse konvexen Bezugsfläche, oder aber einer beliebigen Kombination solcher Bezugsflächen, überlagert sein.

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- 5 - 8

Um an einer vorbestimmten Umlenkstelle innerhalb der Entwässerungsstrecke eine gegenüber einer benachbarten Umlenkstelle unterschiedliche Siebspannung erzeugen zu können, ist es zweckmässig, wenn mindestens einer der

5 Führungsteile in Richtung quer zur Oeffnung des Gehäuses einstellbar ist. Entsprechend kann an den einander benachbarten Umlenkstellen jeweils eine in Laufrichtung der beiden Siebe zunehmende Siebspannung mit entsprechend zunehmender Erhöhung der Intensität der

10 Entwässerung erzielt werden.

Nach einer Ausführungsform der Erfindung, welche bei vorteilhaft geringen Eingriffen in den Aufbau der Langsiebmaschine eine insbesondere im Rahmen der gegebenen Bauhöhe der Maschine durchführbare Vergrösserung der Entwässerungsstrecke gestattet, kann das Gehäuse einer

15 gegen den in Laufrichtung vor der Entwässerungsstrecke liegenden, im wesentlichen ebenen Abschnitt des Langsiebes geneigt verlaufenden Partie der beiden Siebe zugeordnet sein. Entsprechend können die beiden Siebe nach

20 Art von Schenkeln eines Dreiecks gegenüber den vor und nach der Entwässerungsstrecke verlaufenden Partien des Langsiebes ausgelenkt werden; nach entsprechender Einstellung der Führungselemente und Anpassung der / ^{Siebspannung} der beiden Siebe kann, z.B. ohne Aenderung der Sieblängen, eine Vergrösserung der Entwässerungsstrecke erzielt werden, wobei etwa Platz für die Anbringung eines dem Gehäuse nachgeschalteten, zusätzlichen Entwässerungselementes geschaffen wird.

25

Dabei ist es zweckmässig, wenn die beiden Siebe über ein dem Gehäuse in Laufrichtung der beiden Siebe benach-

30 bartes Führungselement gegen eine am Ende der Entwässerungsstrecke angeordnete Umlenkwalze geführt sind, an der sich die beiden Siebe trennen. Bei dieser Ausführungsform kann das dem Gehäuse nachgeschaltete Ent-

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wässerungselement beispielsweise dem zwischen dem Führungselement und der Umlenkwalze verlaufenden Abschnitt der beiden Siebe zugeordnet sein.

- In weiterer Ausgestaltung der Erfindung kann ein für die
- 5 Entwässerung des Papiervlieses besonders günstiger, kontinuierlicher Verlauf der beiden Siebe gewährleistet und damit eine besonders schonende, d. h. die Formation der Fasern praktisch nicht beeinträchtigende Entwässerung des Papiervlieses dadurch erzielt werden, dass die Um-
- 10 lenkelemente je in einer quer zur Oeffnung des Gehäuses beweglichen Halterung um eine quer zur Laufrichtung der beiden Siebe verlaufende Achse neigbar gelagert und je in einer einem vorbestimmten Verlauf der beiden Siebe entsprechenden Winkelstellung einstellbar sind.
- 15 Um einen direkten Kontakt zwischen den Umlenkelementen und dem Langsieb zu vermeiden, können die Umlenkelemente innerhalb einer Schlaufe eines Endlosbandes angeordnet sein, welches im Bereich der Entwässerungsstrecke dem Langsieb entlanggeführt ist.
- 20 Um im Bereich des Gehäuses die Entfernung des bei der Entwässerung des Papiervlieses nach unten anfallenden Siebwassers zu gewährleisten, ist es zweckmässig, wenn die Umlenkelemente je an ihrer der Laufrichtung der beiden Siebe entgegengerichteten Seite eine gegen das Langsieb fuhrbare Abstreifkante aufweisen.

- Um eine genau definierte vordere Begrenzung der Entwässerungsstrecke zu erzielen, kann in weiterer Ausgestaltung der Erfindung das zusätzliche Sieb über eine im Bereich der - in Laufrichtung der beiden Siebe betrachtet -
- 30 vorderen Kante des Gehäuses vorgesehene Führungsfläche

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- 7 - 10.

mit dem Langsieb zusammengeführt sein. Auf diese Weise wird sichergestellt, dass zumindest der Anfang und der grösste Teil der Entwässerungsstrecke im Bereich des Gehäuses verläuft.

- 5 Nach einer Ausführungsform der Erfindung kann eine Intensivierung der Entwässerung dadurch erzielt werden, dass die Führungsfläche an einem der vorderen Wand des Gehäuses zugeordneten Entwässerungselement ausgebildet ist.
- 10 Die Erfindung wird anhand von in der Zeichnung schematisch dargestellten Ausführungsbeispielen erläutert. Es zeigen:
- Fig. 1 eine mit einer erfindungsgemässen Entwässerungseinheit versehene Langsieb-Papiermaschine, und
- Fig. 2, 3 und 4 Ausschnitte aus Papiermaschinen entsprechend derjenigen nach der Fig. 1, mit Entwässerungseinheiten in je einer andern Ausführungsform.

- Die Papiermaschine nach der Fig. 1 enthält ein endloses unteres Langsieb und ein zusätzliches, endloses oberes
- 20 Sieb 2, welches entlang eines mittleren Abschnittes des Langsiebes 1 verläuft und zusammen mit diesem eine Entwässerungsstrecke M bildet. Das Langsieb 1, welches während des Betriebes in einer durch einen Pfeil S ange-deuteten Bewegungsrichtung umläuft, ist über Führungs-
- 25 walzen 3 und Führungszylinder 4 geführt. Die dem oberen Sieb 2 zugekehrte Partie des Langsiebes 1 ist in einem bezüglich seiner Bewegungsrichtung gemäss Pfeil S vor der Entwässerungsstrecke M liegenden, ebenen Abschnitt A über Entwässerungselemente, wie z. B. Siebtische 5a, Foils 5b,
- 30 einen Saugkasten 6 und eine Umlenkwalze 10, und in einem an die Entwässerungsstrecke M anschliessenden

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ebenen Abschnitt B über eine Umlenkwalze 11 und weitere Entwässerungsvorrichtungen, wie z. B. Saugkästen 12, gegen den Führungszylinder 4 geführt. Die Abschnitte A und B liegen in einer gemeinsamen Siebebene E.

- 5 An Anfang des Abschnittes A befindet sich eine Stoffauf-
laufvorrichtung 13, welche in bekannter Weise zur Ver-
teilung von Stoffflüssigkeit auf dem Langsieb und zur Bil-
dung eines auf dieses aufzulegenden Faservlieses dient.
- Das obere Sieb 2 ist ausserhalb der gemeinsamen Ent-
10 wässerungsstrecke M über Führungswalzen 14, 14a und eine
quer zur Siebebene E verstellbare Einstellwalze 15 ge-
führt. Innerhalb der Siebschlaufe des oberen Siebes 2
ist ein gegen die Entwässerungsstrecke M hin offenes
Gehäuse 16 angeordnet, welches beim dargestellten Bei-
15 spiel als Saugkasten ausgebildet ist. Das Gehäuse 16
ist auf die zwischen den
Umlenkwalzen 10 und 11 verlaufende Partie der beiden Siebe
1 und 2 aufgesetzt , wobei die Kanten seiner- in
Richtung des Pfeils S gesehen - vorderen Wand 16a und
20 hinteren Wand 16b unterhalb der Siebebene E zu liegen
kommen, was jeweils einer teilweisen Umschlingung der
Umlenkwalzen 10 und 11 durch das Langsieb 1 entspricht.
In der Oeffnung des Gehäuses 16 sind mehrere, in der
Bewegungsrichtung (Pfeil S) der Siebe 1 und 2 hinter-
25 einander verteilt angeordnete, quer zur Bewegungsrichtung
verlaufende leistenartige Führungsteile 17 für die bei-
den Siebe 1 und 2 vorgesehen. Wie aus der Fig. 1 hervor-
geht, können die dem Sieb 2 zugekehrten Führungsflächen
der Wände 16a, 16b und der Führungsteile 17 in einer ge-
30 meinsamen Ebene liegen.

Die Einstellwalze 15 dient in einer aus der breits er-
wähnten US-Patentschrift 4 176 005 bekannten Weise zum
Einstellen eines zwischen dem Langsieb 1 und dem oberen
Sieb 2 gebildeten Einlaufwinkels für die der Entwässerungs-

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strecke M zuzuführende Suspension. Der Auflaufpunkt des oberen Siebes 2 auf dem Langsieb 1 liegt - im Abstand von der Umlenkwalze 10 - im Bereich der an der vorderen Wand 16a des Gehäuses 16 ausgebildeten Führungsfläche, über welche die beiden Siebe 1 und 2 zusammengeführt werden. Von der Führungsfläche der hinteren Wand 16b sind die beiden Siebe 1 und 2 gemeinsam gegen die Umlenkwalze 11 geführt, welche zugleich als Trennwalze zum Trennen des oberen Siebes 2 vom Langsieb 1 dient. Das Langsieb 1 wird in einem an den Abschnitt B anschliessenden Abschnitt C seines Verlaufes mit einem eine Saugpresswalze 18 umschlingenden Filzband 20 zusammengeführt, welches zur Abnahme des Papiervlieses vom Langsieb 1 dient. Die Saugpresswalze 18 wirkt mit einer Gegenwalze 21 und mit einer Gegenwalze 22 zusammen, über welche ein Sieb 23 geführt ist.

Im Bereich der Entwässerungsstrecke M sind innerhalb der Siebschlaufe des Langsiebes 1 mehrere parallel zu den Führungsteilen 17 verlaufende, stangenförmige Umlenkelemente für die beiden Siebe 1 und 2 angeordnet, welche in Richtung der Pfeile 26 quer zur Oeffnung des Gehäuses 16 je zwischen zwei Führungsteile 17 einführbar und über eine nicht weiter dargestellte Stellvorrichtung je in einer vorbestimmten Stellung bezüglich der Siebebene E einstellbar sind. Wie aus der Fig. 1 hervorgeht, sind die Umlenkelemente 25 gegenüber einer durch die Führungsflächen der Wände 16a, 16b und Führungsteile 17 bestimmten Bezugsebene je in einem in Bewegungsrichtung (Pfeil S) der beiden Siebe 1 und 2 zunehmenden Eindringtiefe angeordnet, derart, dass die beiden Siebe 1 und 2 die Entwässerungsstrecke M in einer wellenförmigen Bahn mit in Bewegungsrichtung zunehmender Amplitude durchlaufen, wobei eine jeweils in Bewegungsrichtung zunehmende Siebspannung erzeugt wird.

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Entsprechend der Darstellung nach der Fig. 1 wird das durch den Stoffauflauf 10 gebildete Faservlies in an sich bekannter Weise vorerst in dem eine Vorentwässerungsstrecke bildenden ebenen Abschnitt A, vorzugsweise mit zunehmender Intensität, nach unten entwässert. Aus diesem Bereich gelangt das gebildete Faservlies zwischen die beiden Siebe 1 und 2 und wird beim Durchlaufen der Entwässerungsstrecke M an den Umlenkstellen der Führungsteile 17 weiter nach unten, und beim Umschlingen der Umlenkteile 25 je nach oben entwässert, wobei das im Bereich der Führungsteile 17 anfallende Siebwasser in einen unterhalb des Gehäuses 16 angeordneten Auffangbehälter 27 gelangt, während das im Bereich der Umlenkelemente 25 nach oben in das Gehäuse 16 abgeschleuderte Wasser in an sich bekannter, nicht weiter dargestellter Weise aus dem Gehäuse 16 abgeführt wird.

Das die Entwässerungsstrecke M durchlaufende Papiervlies wird im Bereich des Gehäuses 16 praktisch ausschliesslich auf mechanische Weise entwässert, wobei der auf die Suspension ausgeübte Entwässerungsdruck durch die Stellungen der Umlenkelemente 25 bezüglich der jeweils benachbarten Führungsteile 17 bestimmt ist. Entsprechend braucht der im Gehäuse 16 zu erzeugende Unterdruck nicht für die Bildung des Entwässerungsdruckes, sondern lediglich für die einen wesentlichen geringeren Energieaufwand erfordernde Entfernung des bei der Entwässerung des Papiervlieses nach oben anfallenden Siebwassers bemessen zu werden.

Die vorstehend beschriebene Ausführung mit ihrem von der Siebebene E nur geringfügig abweichenden Siebverlauf ermöglicht auf einfache Weise, mit vorteilhaft geringem baulichem Aufwand, eine gegenüber bisherigen Ausführungen wesentlich intensivere Entwässerung des gebildeten Papier-

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vlieses. Die beschriebene Ausführung ist aufgrund ihrer einfachen Anordnung insbesondere auch für einen Umbau bestehender Langsiebmaschinen geeignet.

- Bei der Ausführung nach der Fig. 2 ist das Langsieb 1 über einen am Ende des Abschnittes A angeordneten Führungsschuh 30 aus der Siebebene E nach unten ausgeleitet und zusammen mit dem oberen Sieb 2 nach Art von Schenkeln eines Dreiecks über eine unterhalb der Siebebene E, in der Siebschleife des Siebes 2 angeordnete, zusätzliche Führungswalze 14b gegen die Umlenkwalze 11 geführt. Entsprechend ist das Gehäuse 16 mit seiner Saugöffnung auf die von der Siebebene E nach unten geneigt verlaufende Partie der beiden Siebe 1 und 2 aufgesetzt. Wie in der Fig. 2 durch Pfeile 28 angedeutet ist, können auch die Führungsteile 17 auf nicht weiter dargestellte Weise in Richtung quer zur Öffnung des Saugkastens einstellbar und feststellbar sein. Wie aus der Fig. 2 hervorgeht, sind die Führungsteile 17 und die Umlenkelemente 25 so eingestellt, dass ihre Führungsflächen für die beiden Siebe 1 und 2 beidseits einer zum Gehäuse 16 konvex verlaufenden Bezugsfläche liegen, welcher die wellenförmigen Auslenkungen der beiden Siebe 1 und 2 überlagert sind. Durch den im ganzen konvexen Verlauf der beiden Siebe 1 und 2 kann bei entsprechender Durchlaufgeschwindigkeit, aufgrund der dabei auf die Suspension einwirkenden Zentrifugalkraft, die Abfuhr des nach unten austretenden Siebwassers erleichtert werden. Wie weiter aus der Fig. 2 hervorgeht, kann der von der Führungswalze 14b zur Umlenkwalze 11 verlaufenden Partie der beiden Siebe 1 und 2 eine zusätzliche Entwässerungseinrichtung, etwa in Form eines Saugkastens 12a, zugeordnet sein. Es versteht sich, dass der Saugkasten 12a auch weggelassen werden kann.

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Bei der Ausführung nach der Fig. 3 sind die beiden Siebe 1 und 2 im Bereich der Entwässerungsstrecke M über eine konvexe Führungsfläche eines Entwässerungselementes 31 aus der Siebebene E nach oben gegen die in der Siebschlaufe des Langsiebes 1 angeordnete Führungswalze 14b und anschliessend über die Führungswalze 14 geführt. Wie aus der Fig. 3 hervorgeht, kann die Führungswalze 14 als Druckwalze ausgebildet und mit ihrer unteren Mantelfläche in der Siebebene E angeordnet sein, so dass das die Entwässerungsstrecke M durchlaufende Papiervlies noch vor der Trennung der beiden Siebe nach unten entwässert wird.

Gemäss Fig. 3 ist das Entwässerungselement 31 am vorderen Ende des Gehäuses 16 ausgebildet, welches durch eine Wand 16c in zwei voneinander getrennte Kammern unterteilt ist. Das Entwässerungselement 31 ist mit in die vordere Kammer des Gehäuses 16 mündenden Durchtrittsöffnungen 29 versehen, welche eine Entwässerung des über die konvexe Führungsfläche laufenden Papiervlieses nach oben ermöglichen. Das in diesem Bereich nach unten anfallende Siebwasser wird vom Auffangbehälter 27 aufgenommen. Bei dieser Ausführung sind die Führungsteile 17 und ihnen zugeordnete, schaufelartige Umlenkelemente 32a, 32b und 33 im Bereich der hinteren Kammer des Gehäuses 16 so angeordnet, dass ihre Führungsflächen für die beiden Siebe 1 und 2 beidseits einer zum Gehäuse 16 konkaven Bezugsfläche liegen, welcher die wellenförmigen Auslenkungen der beiden Siebe 1 und 2 überlagert sind.

Die Umlenkelemente 32a und 32b sind als Wände eines als Ganzes gegen die Oeffnung des Gehäuses 16 führbaren, zusätzlichen Saugkastens 32 ausgebildet, während die Umlenkelemente 33

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auf nicht weiter dargestellte Weise im Saugkasten 32 quer zur Oeffnung des Gehäuses 16 verstellbar und feststellbar gelagert sind. Bei dieser Ausführung wird das die Entwässerungsstrecke durchlaufende Papiervlies sowohl
5 im Bereich des Entwässerungselementes 31 als auch im Bereich der Oeffnung des Gehäuses 16 nach oben und nach unten entwässert. Anstelle des Saugkastens 32 kann auch ein lediglich zur Aufnahme des bei der Entwässerung nach unten anfallenden Siebwassers bestimmter Auffangbehälter
10 vorgesehen sein. Ebenso können die Umlenkelemente 32a, 32b und 33 je auf einer eigenen Halterung angeordnet sein. Aufgrund des im Bereich der Oeffnung des Gehäuses 16 konkaven Verlaufes der beiden Siebe 1 und 2 kann durch die auf die durchlaufende Suspension einwirkende Zentri-
15 fugalkraft die Abfuhr des nach oben austretenden Wassers erleichtert werden.

Bei der Ausführung nach der Fig. 4 sind das Langsieb 1 und obere Sieb 2 im Bereich der Entwässerungsstrecke M zusammen mit einem in der Siebschlaufe des Langsiebes 1
20 angeordneten, zusätzlichen endlosen Siebband 36 über die Oeffnung des Gehäuses 16 geführt. Das Siebband 36 ist über die Umlenkwalzen 10 und 11 sowie über eine Führungswalze 37 geführt. Die Umlenkwalze 10 kann quer zur Siebebene E einstellbar sein. Wie aus der Fig. 4 hervorgeht,
25 kann das Gehäuse 16 ohne Führungsteile für die beiden Siebe 1 und 2 und das Siebband 36 ausgebildet sein, so dass diese zwischen den Wänden 16a und 16b des Gehäuses 16 in einer zu diesem konkaven, kontinuierlichen Bahn lediglich über Umlenkelemente 38 geführt sind. Die
30 Umlenkelemente 38 sind als Führungsschuhe ausgebildet, welche an ihrer der Bewegungsrichtung (Pfeil S) entgegengerichteten Seite eine Abstreifkante 39 für bei der Entwässerung des Papiervlieses nach unten anfallendes Siebwasser aufweisen. Die Umlenkelemente 38 sind je um eine

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quer zur Bewegungsrichtung (Pfeil S) verlaufende Achse 40 schwenkbar auf einer Halterung 41 gelagert, welche in einem ortsfesten Tragteil 42 quer zur Oeffnung des Gehäuses 16 beweglich geführt ist. Die Halterungen 41 sind je durch eine für sich einstellbare, in der Fig. 4 als Druckfeder 43 dargestellte Spannvorrichtung mit einer vorbestimmten Druckkraft gegen die die Entwässerungsstrecke M durchlaufenden Partien des Siebbandes 36 und der beiden Siebe 1 und 2 verspannt. Dabei sind die Umlenkelemente 38 je in einer dem vorbestimmten Verlauf des Siebbandes 36 und der Siebe 1 und 2 entsprechenden Winkelstellung einstellbar und auf nicht weiter dargestellte Weise feststellbar. Auch bei dieser Ausführung wird das gebildete Papiervlies im Bereich der Umlenkelemente 38 nach oben, und zwischen den Umlenkelementen 38 jeweils nach unten entwässert, wobei durch die je für sich einstellbaren Umlenkelemente 38 ein innerhalb weiter Grenzen frei einstellbarer Verlauf der Siebbahnen und der vorbestimmten Entwässerungsdrücke gewährleistet wird. Durch das zwischen dem Langsieb 1 und den Umlenkelementen 38 verlaufende Siebband 36 können allfällige, beim direkten Kontakt mögliche Beschädigungen des Langsiebes durch die Umlenkelemente 38 verhindert werden. Dabei kann als Siebband ein Sieb oder ein anderes, vorzugsweise wasserdurchlässiges Band, z. B. ein Filzband, verwendet werden.

In den Fig. 1 bis 3 sind aus Anschaulichkeitsgründen die Umlenkungen der beiden Siebe 1 und 2 übertrieben gross dargestellt. Im Interesse eines geringen Siebverschleisses, und unter Berücksichtigung einer z. B. 1 - 15 mm betragenden Schichtdicke der zwischen den Sieben 1 und 2 befindlichen Suspension, können die quer zur Bewegungsrichtung (Pfeil S) der Siebe 1 und 2 gemessenen Abstände zwischen den bei diesen Beispielen nach oben weisenden

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- Führungsflächen der Umlenkelemente 25 bzw. 32a, 32b, 33 und je einer durch die nach unten weisenden Führungsflächen der beiden jeweils benachbarten Führungsteile 17 bestimmten Bezugsebene in Wirklichkeit etwa 0 - 20 mm betragen. Dies wird in der Regel etwa 0 - 20 % des in der Bewegungsrichtung (Pfeil S) gemessenen Abstandes zwischen den jeweils durch die beiden Siebe 1 und 2 getrennten, einander benachbarten Umlenk- und Führungsteilen entsprechen.
- 10 Es sind noch verschiedene andere Ausführungsformen möglich. So kann etwa anstelle der als Saugkästen ausgebildeten Gehäuse 16 jeweils auch ein mit einer anderen Ableit- einrichtung für das Siebwasser versehenes Gehäuse verwendet werden, welches z.B. eine geneigte Abflussfläche auf-
15 weisen kann. Ferner kann vor dem zusätzlichen Sieb 2 eine weitere Stoffauflaufvorrichtung angeordnet sein, welche in den zwischen den beiden Sieben 1 und 2 gebildeten Spalt gerichtet ist. Bei den Ausführungen nach den Fig. 1 bis 3 können auch mehrere Umlenkelemente 25 zwischen zwei be-
20 nachbarten Führungsteilen 17 angeordnet sein. Bei der Ausführung nach Fig. 4 kann z. B. das Siebband 36 weggelassen werden. Ebenso können die Umlenkelemente 38 mit im Gehäuse 16 anzuordnenden Führungsteilen entsprechend den Teilen 17 in den Fig. 1 bis 3 kombiniert werden.

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Fig.1

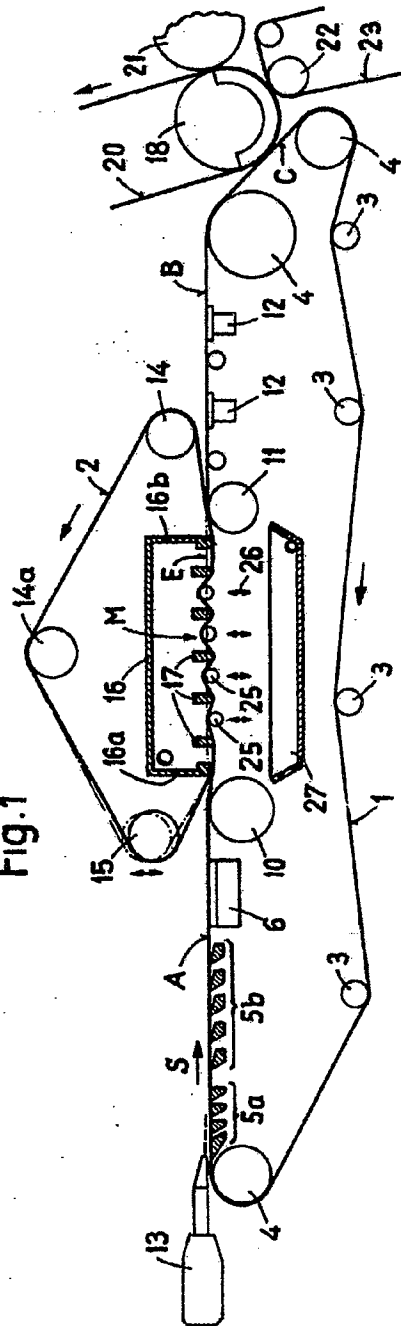


Fig.2

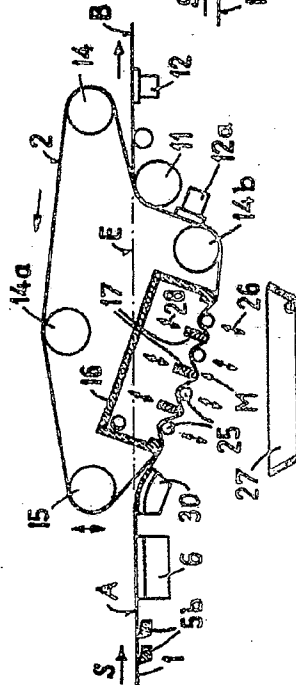
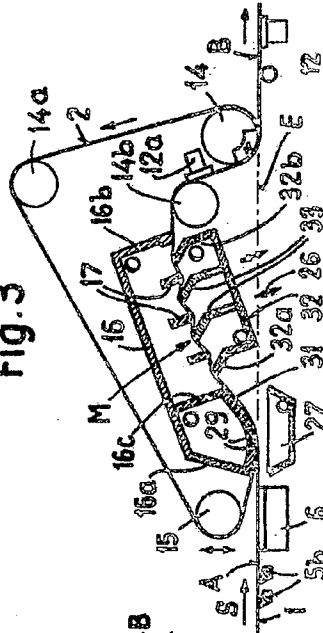


Fig.3



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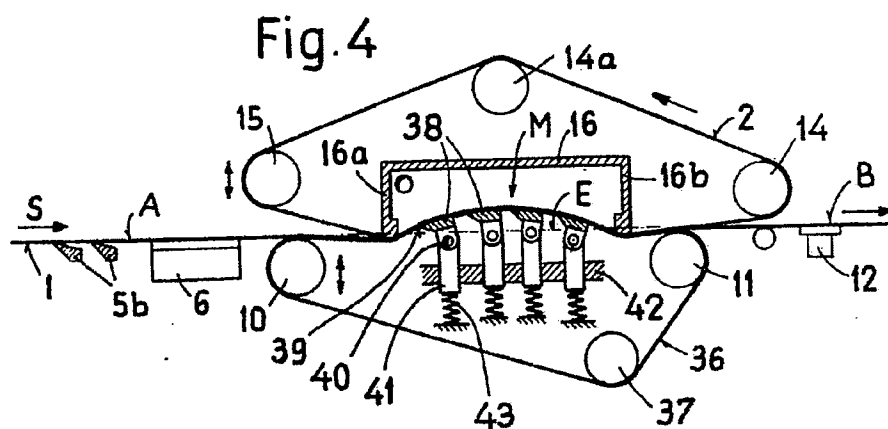


Exhibit 7

United States Patent [19]

Tissari

[11] Patent Number: 4,609,435

[45] Date of Patent: Sep. 2, 1986

[54] PROCESS AND EQUIPMENT IN THE FORMING OF PAPER WEB

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[73] Assignee: Valmet Oy, Finland

[21] Appl. No.: 693,170

[22] Filed: Jan. 22, 1985

[30] Foreign Application Priority Data

Jan. 20, 1984 [FI] Finland 840246

[51] Int. Cl.⁴ D21F 1/00[52] U.S. Cl. 162/203; 162/211;
162/301; 162/352[58] Field of Search 162/203, 205, 208, 211,
162/300, 301, 303, 348, 352

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Primary Examiner—S. Leon Bashore

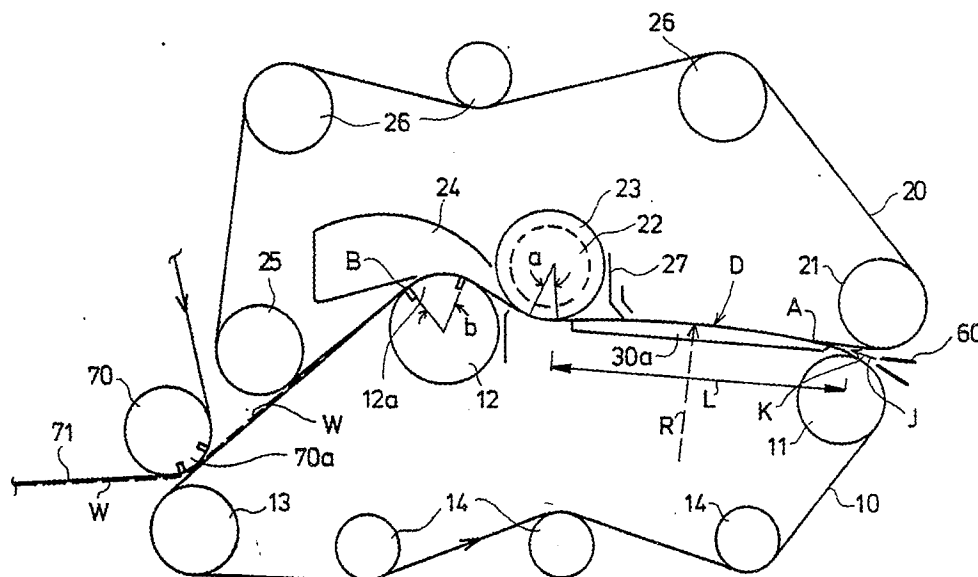
Assistant Examiner—K. M. Hastings

Attorney, Agent, or Firm—Steinberg & Raskin

[57] ABSTRACT

A process in the forming of a paper web, the dewatering of the pulp web, and of the paper web being formed comprises feeding the pulp suspension jet from the slice of the headbox into a gap formed by two wires, the gap becoming narrower in the feeding direction of the pump suspension jet. Water is removed from the pulp web when the web is in compression between the carrying wire and the covering wire within the twin-wire forming zone, which begins immediately after the feeding gap. The twin-wire forming zone is curved towards the loop of the carrying wire with a curve radius which is selected large enough so that the wire tensioning pressure resulting from it and acting upon the pulp web becomes low and the water removed from the pulp web is not splashed from the inside surface of the wire loop by the effect of centrifugal force dependent upon the curve radius. The joint run of the wires is passed over an open-surfaced forming roller, so as to be curved within a relatively small angle towards the loop of the covering wire. The joint run of the wires is passed over a forming roller, so as to be curved towards the loop of the carrying wire. The formed web is detached from the wire and transferred into the press section of the paper machine. A specifically structured twin wire former carries out the process.

12 Claims, 14 Drawing Figures



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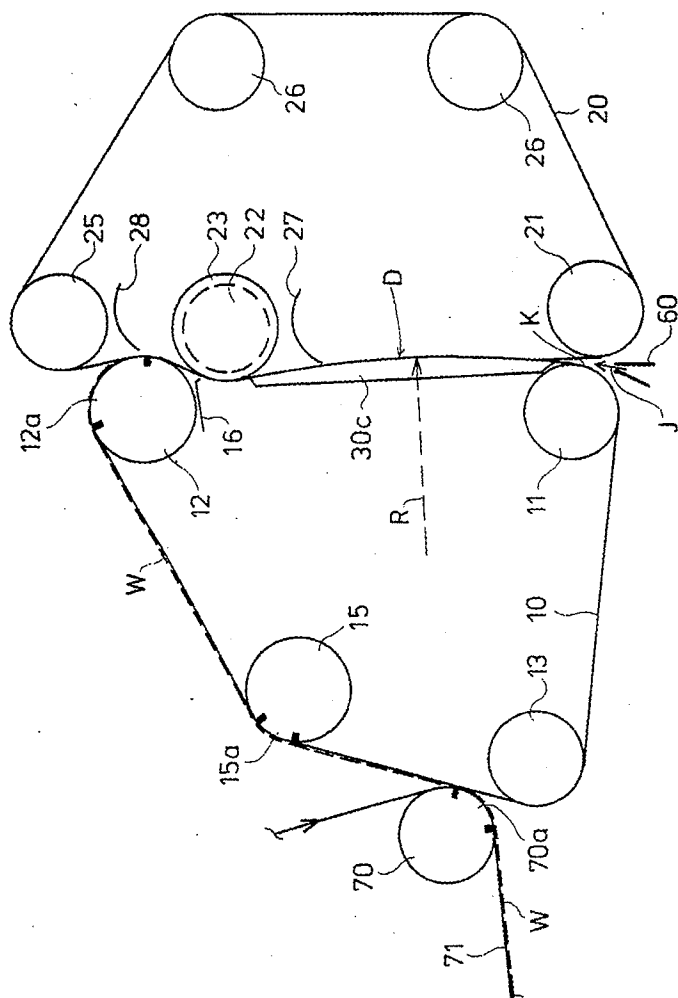


FIG. 3

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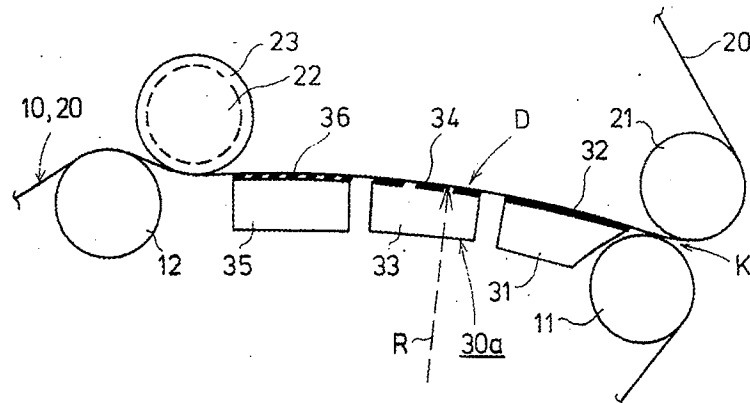


FIG. 4

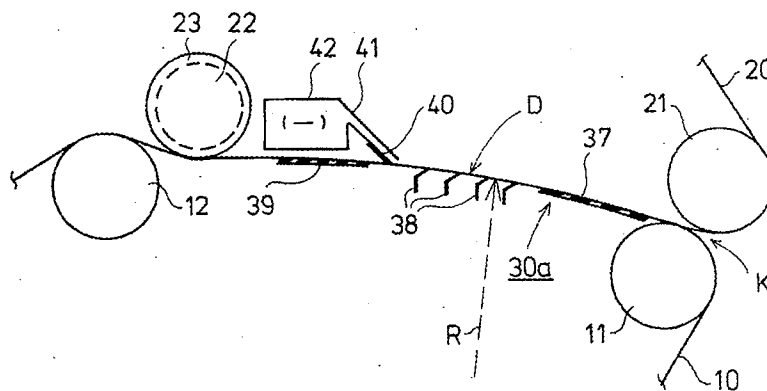
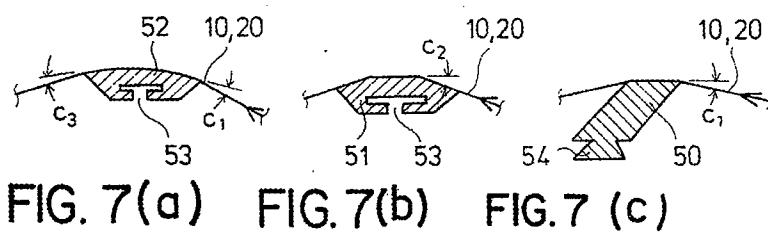
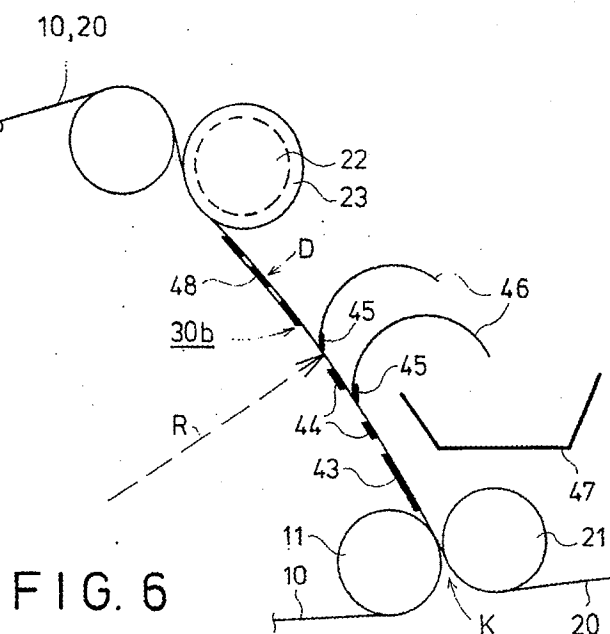


FIG. 5

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FIG.8(a)

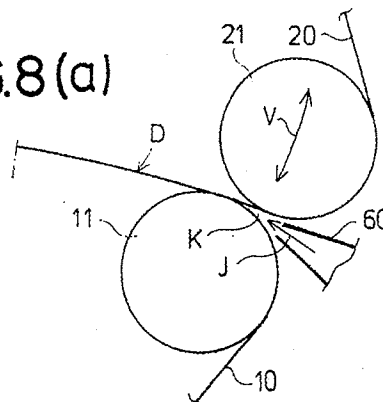


FIG.8(b)

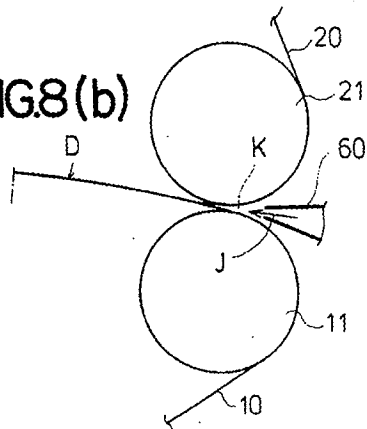


FIG.8(c)

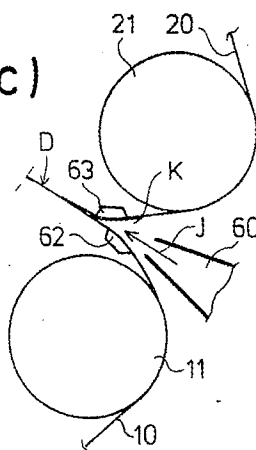


FIG.8(d)

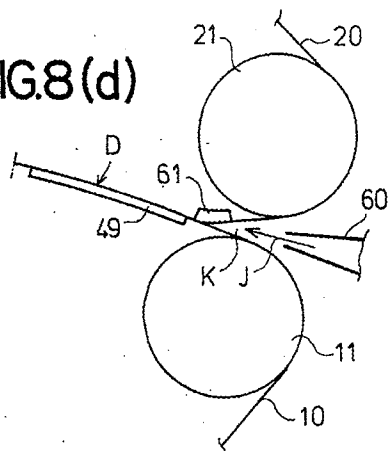
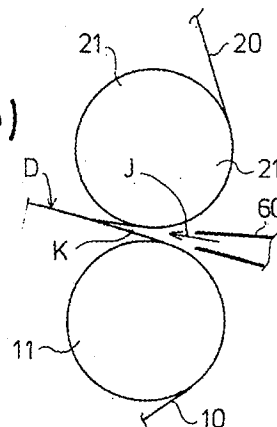


FIG.8(e)



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PROCESS AND EQUIPMENT IN THE FORMING OF PAPER WEB

BACKGROUND OF THE INVENTION

The present invention relates to a process and equipment used in the forming of a paper web. More particularly, the invention relates to a process in the forming of paper web and in the dewatering of the pulp web and of the paper web formed.

The invention further relates to a twin wire former intended for carrying out the process of the invention. The former comprises a loop of a carrying wire guided by the breast roller, the forming roller and the guide rollers, as well as a loop of a covering wire guided by the breast roller, the forming roller and the guide rollers. The wire loops together form a forming gap between and in connection with the breast rollers. The pulp suspension jet is supposed to be fed into the forming gap. The forming gap is followed by a joint twin-wire forming and dewatering zone of the wires. The web is arranged after the zone, so as to follow along with the carrying wire, from which the web is detached and passed into the drying section of the paper machine.

As the running speeds of paper machines are increased, several problems in the forming of the web are accentuated even further. Phenomena that act in the forming section of a paper machine upon the fiber mesh and upon the water that is still relatively free in connection with said mesh, in particular the force effects, are usually intensified in proportion to the second power of the web speed. The maximum web speeds of the present newsprint machines are of the order of 1200 meters per minute. Newsprint machines are, however, being planned in which a web speed of up to about 1500 m/min is aimed at. Such increase in speed causes several problems, which will be discussed in the following.

A so-called hybrid former is a former in which the forming zone has a single-wire initial portion, onto which the headbox feeds the pulp suspension jet. A twin wire forming zone follows the single-wire portion. A problem of hybrid formers, as of four-drinier formers, is that at high web speeds splashes occur in the pulp web. These splashes result from the collision angle between the pulp jet and the forming board and, on the other hand, from the scattering of the highly turbulent pulp jet as said jet meets the forming board. The reach of the splashes in the direction of the pulp web is quite long, and these splashes cause marks in the pulp web being formed and thereby deteriorates the quality of the paper produced. On the other hand, the foil pulses used for the removal of water from a fourdrinier former become so high at high speeds that this causes splashing which deteriorates the formation of the web. As is well known, the foil pulsation increases proportionally to the second power of the speed. In order that the pulsation be maintained below the splashing limit at a high speed, the foil angles must be made so small (approaching the angle 0°) that an adequate dewatering capacity is not obtained.

It is a further drawback of a fourdrinier former that transverse profile defects present in the discharge jet may be accentuated further on the fourdrinier wire, for example, due to diagonal flow components in the pulp slurry (so-called plowings on the wire board), or in the form of stronger longitudinal streaks.

It is a common opinion that the variations in grammage in twin gap formers remain lower than in fourdrinier formers or hybrid formers. This is due to the fact

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that in gap formers, the jet is supplied straight into the gap, wherein the pulp jet is immediately "supported" between two wires, so that no transverse flows can arise, which transverse flows would intensify the defects in profile.

When the speeds of paper machines, in particular of newsprint machines, increase, uniformity of the web is, besides being a factor of paper quality, also important, since uniformity of the web has an ever higher effect on the running quality of the paper machine, because the weakest portions of the web are, as a rule, the cause of the breaks.

SUMMARY OF THE INVENTION

The principal object of the invention is to provide a process and equipment in the forming of a paper web which are suitable for high web speeds up to 1500 m/min, and even higher speeds.

An object of the invention is to provide a process and a former that are particularly well suitable for the production of low-grammage printing papers, such as newsprint and LWC-paper, in particular when the grammage of the papers is within the range of 30 g/m² to 60 g/m². Developmental progress is continuously lowering the grammages, which imposes ever higher requirements on the uniformity of paper. At the present time, 45 g/m² is common for newsprint, but, in the near future, it will be 40 g/m² and lower.

Another object of the invention is to provide a web forming process and a former via which an improved formation and sheet forming is achieved, but in which, nevertheless, a retention of at least equal standard is accomplished as in the prior art formers.

Still another object of the invention is to provide a web forming process and a former via which a uniform distribution of fines and fillers is obtained, so that the opposite surfaces of the web are as equal to each other as possible.

Yet another object of the invention is to provide a web forming process and a former via which the porosity of the paper produced is low whereby there are no so-called pinholes.

Another object of the invention is to provide a web forming process and a former via which the offset printing properties of the paper produced are good.

Still another object of the invention is to provide a web forming process and a former via which a sufficiently high dry solids content is accomplished after the wire section.

The foregoing objects are achieved by the web forming process and the former, whose most important characteristics are described as follows.

The process of the invention comprises the following steps carried out in the following sequence.

(a) The pulp suspension jet is fed from the slice of the headbox of the paper machine into a gap formed by two wires. The gap becomes narrower in the direction of feed of the pulp suspension jet. Water is removed from the pulp web when said web is in compression between the carrying wire and the covering wire within the twin-wire forming zone, which is immediately after the feeding gap.

(b) The twin-wire forming zone is made curved with a relatively large curve radius towards the loop of the carrying wire. The curve radius is selected large enough so that the wire tensioning pressure resulting from it and acting upon the pulp web becomes low and

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the water removed from the pulp web is not, at least not to a disturbing extent, splashed from the inside surface of the wire loop, by the effect of centrifugal force dependent on the curve radius, within the twin-wire forming or dewatering zone.

(c) The joint run of the wires is passed over an open-surfaced forming roller, so as to be curved within a relatively small angle towards the loop of the covering wire.

(d) The joint run of the wires is further passed over a forming roller within a certain sector, so as to be curved towards the loop of the carrying wire.

(e) The formed web is detached from the wire and, in a manner known in itself, is transferred into the press section of the paper machine.

The former of the invention comprises a combination of the following components.

(a) Dewatering equipment is fitted within the twin-wire portion substantially immediately after the forming gap inside the loop of the carrying wire. The dewatering equipment is fitted so as to guide the joint run of the wires, so that such run is curved with a curve radius towards the carrying wire loop. The curve radius is within the range of $R=5$ m to 50 m, preferably $R=10$ m to 20 m.

(b) An open-surfaced forming roller is fitted substantially immediately after the dewatering equipment inside the loop of the covering wire. The twin-wire run is arranged on the forming roller so as to be curved within a small angle towards the loop of the covering wire.

(c) A forming roller is fitted in proximity with the forming roller inside the loop of the carrying wire. The joint run of the wires is arranged on the forming roller, so as to be curved towards the loop of the carrying wire within a certain angle.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the invention, reference is had to the following description, taken in connection with the accompanying drawings, in which:

FIG. 1 is a schematic side view of an embodiment of the invention, in which the twin-wire forming zone is substantially horizontal;

FIG. 2 is a schematic side view of another embodiment of the invention, in which the twin-wire forming zone rises diagonally upward;

FIG. 3 is a schematic side view of still another embodiment of the invention, in which the twin-wire forming zone rises vertically;

FIG. 4 is a schematic diagram of an embodiment of the twin-wire forming section and an embodiment of dewatering equipment placed inside the carrying wire loop in the twin-wire forming zone;

FIG. 5 is a schematic diagram of another embodiment of the dewatering equipment;

FIG. 6 is a schematic diagram of an embodiment of twin-wire dewatering equipment in a twin-wire forming zone which rises diagonally upward, as shown in FIG. 2;

FIGS. 7a, b and c are cross-sectional views of different embodiments of deck ribs which are placed in the twin-wire forming zone and which determine the running of the wires; and

FIGS. 8a, b, c, d and e are schematic diagrams of different arrangements of the forming gaps into which pulp suspension is fed.

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DESCRIPTION OF PREFERRED EMBODIMENTS

The former shown in FIGS. 1, 2 and 3 includes a carrying wire 10 and a covering wire 20, which have a joint twin-wire forming zone D. The former of the invention is a so-called gap former, in which the wires, converging towards each other as guided by breast rollers 11 and 21, define a forming gap K between the wires. The slice portion 60 of the head box feeds a pulp suspension jet J directly into the forming gap K. A forming roller 12, provided with a suction zone 12a, is inside the loop of the carrying wire 10. The return run of the wire 10, guided by the guide rollers 14, is after the wire 10 drive roller 13. A forming roller 22 is inside the loop of the covering wire 20, after the breast roller 21. The forming roller 22 is a dandy-roller type forming roller provided with a very open surface 23. A dewatering trough 24, which covers the sector b of the roller 12, is provided after the forming roller 22. In the sector b, the wires 10, 20 are curved downwards as guided by the forming roller 12. The covering wire 20 is passed to its return run, which is guided by the guide rollers 26, via the reversing roller 25.

A forming board 30 is provided after the forming gap K between the wires 10 and 20, inside the loop of the carrying wire. The forming board is denoted in FIG. 1, by reference numeral 30a, in FIG. 2, by reference numeral 30b, and in FIG. 3, by reference numeral 30c. The forming board 30 extends from the range of the gap K to the forming roller 22. The forming board 30, which is all the aforementioned forming boards 30a, 30b and 30c, has a certain relatively large curve radius R, whose center of curvature is placed at the side of the carrying wire 10. The dewatering equipment at the forming board 30 may vary within quite wide limits, and some examples of different embodiments of equipment are shown in FIGS. 4, 5, 6 and 7. The centrifugal forces are relatively low at the forming board due to the large curve radius R, so that there is no splashing. As is well known, the dewatering pressure between the wires 10 and 20 is calculated from an equation $P=T/R$, wherein T =tension of the covering wire 20, and R =the curve radius of the forming board 30.

Regarding the operation of the forming board 30, the details of which are hereinafter discussed, it should be stated in this connection that water is removed from the pulp web being formed onto the surface of the covering wire 20. However, with a large curve radius R, the water does not fly apart from the wire in the position of the forming board shown in FIG. 1, because the gravitation and surface tensions of the liquid outweigh the centrifugal force. This "floating" of water may, in certain paper qualities, be favorable for the structure and properties of the upper portions of the web. The length L of the forming board 30 is, as a rule, within the range of 2 to 5 m. The curve radius R is usually within the range of $R=5$ to 50 m; most commonly the applications are found within the range of $R=10$ to 20 m.

The foregoing curvature R of the twin-wire forming zone D at the forming board 30 also has the important effect that the wires 10 and 20 maintain their posture in the lateral direction, and said wires are not formed into wavelike bag formations, which might occur in a straight twin-wire run.

The former of the present invention is a so-called full-gap former, and does not have a single-wire initial portion, which provides certain advantages. When the

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pulp suspension jet J is fed straight into the gap K, no detrimental transverse flows are generated, but the jet is immediately "supported" between the wires 10 and 20. The orientation of the fibers may be controlled by adjustment of the speed of the jet J relative to the speed of the wires 10, 20.

Dewatering occurs via the carrying wire 10 after the gap K, within the twin-wire portion D. Dewatering usually occurs via both wires 10 and 20, due to the tensioning pressure of the wire 10, in the sector a of the forming roller 22, the magnitude of this sector being within the range of $\alpha=1^\circ$ to 50° , usually within the range of 5° to 25° . Most of the water running along in the meshes of the covering wire 20 and on the inside surface of its meshes, has access through the open surface 23 of the forming roller 22, and this water flies from the forming roller 22 into the dewatering trough 24 due to the effect of centrifugal force. The magnitude of the sector b of the forming roller 12 is within the range of 10° to 90° , usually within the range of 30° to 60° . The water drained within the sector b is passed into the trough 24, and from there to the sides of the forming section. The suction zone 12a of the forming roller 12 ensures that the web W follows along with the carrying wire 10.

If the forming roller 12 of FIGS. 1, 2 and 3 is not provided with a suction zone 12a, but operates as an open-surfaced or smooth-surfaced forming roller, a separate wire-suction roller with a corresponding wire coverage is required inside the wire loop 10 before the web is transferred into the press section (cf. the suction roller 15 in FIG. 3). In such case, it is possible to use dry suction boxes inside the wire loop 10 on the wire run between the forming rollers 12 and the separate suction roller, in order to ensure the transfer of the web and to increase the dry solids content.

The twin-wire portion, that is, the wires 10 and 20 run substantially together, starts at line A and ends at line B. The web W is detached from the carrying wire 10 in the suction zone 70a of the pick-up roller 70 and transferred to the pick-up felt 71, on which the web W is passed further, in a known manner, into the press section of the paper machine.

The aforescribed forming roller 22, which is preferably a dandy-roller type forming roller, improves the base of the web W by causing an increase in the pressure in the web and shear forces out of the web, as well as removing water in the aforescribed manner. The combined forming and suction roller 12 removes water, by the effect of the tension of the wire 20, through both of the wires and, by the effect of the suction 12a, through the wire 10. If required, it is possible to use suction boxes on the straight run of the carrying wire 10 between the forming and suction roller 12 and the drive roller 13.

The diameter of the forming roller 22 is preferably rather large, 1 to 2 m. The diameter of the forming and suction roller 12, which affects the centrifugal force by which water is removed through the covering wire 20, is usually smaller than that of the forming roller 22, that is, within the range of 0.2 m to 1.5 m. These diameters also depend upon the mechanical strains, for example, on the covering angles a and b.

The length L of the twin-wire draining or forming zone D between the forming gap K and the forming roller 22, in which zone the dewatering equipment 30 is placed, is usually within the range of $L=2$ m to 6 m. A so-called wedgewise narrowing gap is usually used as

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the gap K. The length of the gap K, as calculated from a plane extending through the axes of rotation of the breast rollers 11 and 21, up to the line A, may be from less than 0.5 m to about 1 m.

The operation of the gently curved forming zone D placed at the forming board 30 and the dewatering equipment provided within the zone D are hereinafter described with reference to FIGS. 4 to 7. Generally speaking, the zone D consists of one or several deck surfaces tensioning the wires 10, 20 with a curve radius R. The openness of the deck surface varies from an almost closed curved deck to a highly open deck construction, assembled from rib-like members, for example. In any case, even the individual ribs or deck surfaces are grouped so as to provide the wires 10, 20 in the forming zone D with a relatively gentle curve radius R, which is as hereinbefore stated, usually within the range of $R=5$ m to 50 m, preferably 10 m to 20 m. Thus, the centrifugal forces acting in the forming zone D remain low even at high velocities v. The dewatering and formation are promoted in the zone D by the pressure pulsation generated by the alternate open spaces and closed deck surfaces.

The forming board 30a, shown in FIG. 4, and placed in the forming zone D, comprises a forming shoe 31 of a large curve radius R immediately after the gap K. The forming shoe 31 is provided with a smooth-surfaced closed deck 32. After the forming shoe 31, is a forming board 33 having a curve radius R, which is provided with a rib deck 34. Open slots are provided between the ribs of the deck 34. The water may be removed through the slots downwards through the carrying wire 10. A third dewatering member of the forming board is a suction box 35, which is connected to a vacuum system and is provided with a rib deck 36 having transverse slots.

In FIG. 5, the forming board 30a in the forming zone D comprises a rib deck 37 of a certain curve radius R, which is placed immediately after the gap K. The rib deck 37 is provided with transverse open slots between the ribs. A curved shoe, consisting of narrow scraping ribs 38, is provided on the deck 37. A deflector 40 is provided after the shoe 38, inside the loop of the covering wire 20. The deflector 40 is connected via the duct 41 to a suction box 42, which, in turn, is connected to the vacuum system of the paper machine.

In FIG. 6, the upwardly slanting forming zone D, rising at an angle of about 40° to 60° , comprises a closed-surface forming deck 43 inside the carrying wire 10 and thereafter forming ribs. Deflectors 45 are provided at the forming ribs, inside the loop of the covering wire 20, and curved guide surfaces 46 are connected to said deflectors and guide water drained through the meshes in the wire 20 into the collecting trough 47. There is a rib deck 48 after the deflectors 45, inside the wire 10.

The curve radius R does not have to remain unchanged throughout the entire length of the forming zone D. In one possible embodiment, the curve radius is changed continuously or stepwise so that at the end of the forming zone D, next to the gap K, the curve radius is near the upper limit of the range of variation of $R=5$ to 50 m, and at the final end of said zone, closer to the lower limit. In this way, the dewatering pressure can be increased gradually, and the dewatering made very gentle.

When the run of the wire is closer to horizontal (FIG. 1) than to vertical, the water passing through the cover-

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ing wire 20 can be collected by a separate collecting device, such as a suction box 42 connected with a deflector 40, as in FIG. 5, or the water passing through the wire 20 may be allowed to "float" on said wire and pass through the former roller 22 of a very open surface structure 23, whereupon the water flies, as thrown by centrifugal forces, into dewatering troughs or collecting basins 24 (FIG. 1). The latter mode of removal of the water is possible, because the initial dewatering zone constructed with a larger curve radius R , as compared with the solutions accomplished in the prior art, does not, by means of its centrifugal force, throw the water drained upwards, so that it flies high up. Thus, with a radius $R=30$ m, for example, the limit velocity at which the centrifugal force surpasses the force of gravitation is

$$v = \sqrt{gR} = \sqrt{9.81 \times 30 \text{ m/s}} = 17.2 \text{ m/s}$$

In reality, the limit speed v is even somewhat higher than that calculated above, because the surface tension and capillary forces of water in the meshes of the wire 20 increase the adhesion of the water to said wire considerably. It can be estimated that the water does not start flying apart from the wire with a radius $R=30$, even at a speed of almost 25 m/s.

Another advantage that is obtained with the large curve radius R at the same time is the very gentle dewatering, due to the low dewatering pressure $P=T/R$. The gentle dewatering is for the purpose of attaining high retention and, at the same time, versatile control of the formation process, because the dewatering has been timed on a relatively long distance. As is known in the prior art, the more highly pressurized dewatering in gap formers occurs within such a short distance that the process cannot be controlled in practice. However, the process is self-controlling, that is, it depends only on pulp conditions and grammage, for example.

The dewatering pressure $P=T/R$, and $P=5/20$ kPa=0.25 kPa, when $R=20$ m and $T=5$ kN/m. Ordinarily, in the prior art embodiments of gap formers, the pressure is 1 to 10 kPa, and even the negative foil pressures used in fourdrinier machines are of the same order of magnitude.

The elements of the forming boards 30 may be at least partly adjustable so that the pressing of the individual members perpendicularly against the wires 10, 20 may be varied, so that the pressure pulse of the member concerned may be adjusted thereby. Likewise, the positions of successive members can be varied, so that the main curve radius of the wire run is changed to some extent. Relatively little plays are required in order to change the curvature of large curve radii, within the range of $R=5$ m to ∞ , for example. The length of the straight portion is, however, limited by the necessity for tensioning the wires 10, 20 in arch form, required as the posture for preventing wrinkling of said wires.

If desired, the dewatering effect can also be intensified by negative pressure by using auxiliary suction in a box provided with a slotted deck, or by placing ribs at the foil angles, as is done, in a manner known in the prior art, with fourdrinier wires. It is also possible to use so-called deflectors at one or both sides of the wires 10, 20, as is shown in FIGS. 5 and 6. A deflector is defined to be a relatively narrow-tipped rib or doctor pressing the wire. As shown in FIG. 5, auxiliary suction in the form of the suction box 42 is used in the deflector 40

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placed inside the loop of the covering wire 20 in order to facilitate the collecting of water. A curved forming surface may also be constructed of wider unified solid or slotted decks and of different combinations of same, as shown in FIGS. 4, 5 and 6. When deflectors 40 and 45 are used inside the loop of the covering wire 20, the main curvature of the wires 10, 20 at said deflectors momentarily becomes a straight line, or even a negative curvature ($R<0$), wherein the center of curvature is shifted to the side of the loop of the covering wire 20, within this limited area.

FIG. 7 shows some examples of the deck ribs forming a curved wire run. Pressure peaks and additional pulsations can be produced in the pulp web W formed, due to the effect of an angular run of the wires 10, 20. This angular run is illustrated in FIG. 7a by the angles c_1 and c_3 , in FIG. 7b by the angle c_2 , and in FIG. 7c by the angle c_1 . As shown in FIG. 7a, the rib 52 has a uniformly curved guide surface. The rib is affixed to the forming board by a groove 53, for example. The rib 51 of FIG. 7b is provided with an edged guide surface. FIG. 7c shows a narrower rib 50 of the deflector type, which is affixed to the forming board by a dovetail portion 54.

The gap K is preferably adjustable, so that the penetration of the headbox jet J between the wires 10, 20 can be controlled.

In FIG. 8a, the gap K is formed by a light wire nip against the breast roller 11. The upper wire 20 contacts the breast roller 11 of the lower wire 10. The gap K can be adjusted by a height adjustment of the breast roller 21 of the upper wire 20, as indicated by an arrow V . The breast roller 11 of the lower wire 10, constituting the counter roller of the wire nip or gap, may be open or smooth-surfaced.

As is shown in FIG. 8b, the breast roller 21 of the upper wire 20 forms the gap or nip against the lower wire 10. The gap K is adjusted by a height adjustment of the upper and/or lower wire 10, 20.

The gap arrangement shown in FIGS. 8a and 8b may also be modified so that the roller forming the gap K does not quite contact the opposite wire, but a gap-like slot remains between the roller and the wire. The slot is completely filled by the discharge jet, whereby pressure is produced, or the nip proper and the formation of pressure start slightly after this position (FIG. 8e). In FIGS. 8a and 8b, in addition to the aforescribed modes, the narrowing of the wires 10, 20 in the gap K can be adjusted by rib-shaped members 62 and 63, as shown in FIG. 8c, considerably more sharply curved than the beginning dewatering and forming zone D , either from one or both sides of the wires 10, 20. In this case, the wires 10, 20 are brought close to each other to form a gap K narrowing in accordance with the draining of water, and the starting point of the nip, that is, the point at which the tension of the wires 10, 20 starts producing pressure on the pulp web, can be adjusted. The direction of the headbox jet J may be adjusted to the side of either one of the wires 10, 20, or to the middle of the gap K , besides the controls shown in the FIGS.

As shown in FIG. 8d, a rib-shaped, curved member 61 is in the gap, against the loop of the wire 20. After the rib-shaped curved member 61, against the inside surface of the wire 10, is a member 49 provided with a closed deck, at least in the initial part, within the area of the gap K .

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The invention is by no means restricted to the aforementioned details which are described only as examples; they may vary within the framework of the invention, as defined in the following claims.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above constructions without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

What is claimed is:

1. In a paper machine, a process in the forming of paper web and in the dewatering of pulp web and of paper web being formed, comprising the steps of:
 feeding a pulp suspension jet from a headbox slice into a gap formed by a looped carrying wire and a looped covering wire, said looped carrying and covering wires having joint runs defining a twin-wire forming zone which begins immediately following said gap and in which a pulp web is formed; passing said twin-wire forming zone over dewatering means situated within the loop of said carrying wire for imparting a first gently curved configuration to an initial portion of said twin-wire forming zone immediately following said gap, the curve defined by said first curved configuration having a radius of a length in the range of between about 5 to 50 meters and extending to the side of said carrying wire so that said initial portion of said twin-wire forming zone is curved towards the carrying wire loop, by which centrifugal forces acting on the pulp web in said initial portion of said twin-wire forming zone passing over said dewatering means is insufficient to cause substantial splashing at an inner face of said covering wire loop; passing an intermediate portion of said twin-wire forming zone over a sector of an open-faced first forming roller situated within the loop of said covering wire substantially immediately after said dewatering means to impart a second curved configuration to said intermediate portion of said twin-wire forming zone which is curved towards said covering wire loop; passing a subsequent portion of said twin-wire forming zone over a sector of a second forming roller situated within the loop of said carrying wire substantially immediately after said first forming roller to impart a third curved configuration to said subsequent portion of said twin-wire forming zone which is curved towards said carrying wire loop in the same direction as the curvature of the initial portion; and detaching the formed web from said forming wire and transferring the web into a press section of the paper machine.

2. A process as claimed in claim 1, wherein said curve radius of said first curved configuration of said twin-wire forming zone is within a range of between about 10 to 20 meters.

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3. A process as claimed in claim 1, wherein said curve radius of said first curved configuration of said twin-wire forming zone is selected so that the dewatering pressure therein is substantially less than about 1 kPa and so that the tension of said carrying and covering wires is of the order of 5 kN/m.

4. A process as claimed in claim 1, further comprising the step of providing pressure pulsation in the pulp web being formed in said twin-wire forming zone.

5. A process as claimed in claim 1, wherein said paper machine further includes a dewatering trough, said process further comprising the steps of transferring water present at the inside surface of the mesh of said covering wire and in the meshes of said wire substantially through or past the open surface of the said first open faced forming roller via said first open-faced forming roller and removing said water, as thrown by centrifugal forces, over said second forming roller into the dewatering trough inside the loop of said covering wire.

6. A process as claimed in claim 1, wherein said paper machine further includes a suction zone on said second forming roller and a pick-up device, said process further comprising the steps of removing water by negative pressures prevailing in the suction zone at least through said carrying wire and additionally insuring via said negative pressures that, after the twin-wire portion, the web follows along with said carrying wire and detaching said web from said carrying wire via the pick-up device.

7. A process as claimed in claim 1, wherein said paper machine further includes a suction zone on said second forming roller, said process further comprising the steps of deflecting said carrying and covering wires of said intermediate portion of said twin-wire forming zone over an angle in the range of between about 1° to 50° on said first open-faced forming roller, and deflecting said carrying and covering wires of said subsequent portion of said twin-wire forming zone over an angle in the range of between about 10° to 90° on said second forming roller having a suction zone.

8. In a paper machine, apparatus for forming a paper web and dewatering a pulp web and a paper web being formed, comprising:

a headbox slice;

a looped carrying wire;

a looped covering wire;

said looped carrying and covering wires defining a gap located to receive a pulp suspension jet from the headbox slice, said carrying and covering wires having joint runs defining a twin-wire forming zone beginning immediately after said gap in which a pulp web is formed;

dewatering means situated within the loop of said carrying wire for imparting a first gently curved configuration to an initial portion of said twin-wire forming zone immediately following said gap, the curve defined by first curved configuration having a radius of a length in the range of between about 5 to 50 meters and extending to the side of said carrying wire so that said initial portion of twin-wire forming zone is curved towards the carrying wire loop, by which centrifugal force acting on the pulp web in said initial portion of said twin-wire forming zone passing over said dewatering means is insufficient to cause substantial splashing at an inner face of said covering wire loop;

an open-faced first forming roller situated within the loop of said covering wire substantially immedi-

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ately after said dewatering means over a sector of which an intermediate portion of said twin-wire forming zone passes to impart a second curved configuration to said intermediate portion of said twin-wire forming zone which is curved towards said covering wire loop; and

a second forming roller situated within the loop of said carrying wire substantially immediately after said first forming roller over a sector of which a subsequent portion of said twin-wire forming zone passes to impart a third curved configuration to said subsequent portion of said twin-wire forming zone which is curved towards said carrying wire loop in the same direction as the curvature of the initial portion.

9. The combination of claim 8 wherein said dewatering means includes at least one dewatering member situated within said carrying wire loop of the group consisting of a forming shoe having a closed deck, a

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forming shoe having a ribbed deck, a suction box having a ribbed deck, a suction box having a perforated deck and connected to a vacuum system, a deck having a curvature and consisting of ribs, and a curved shoe having narrow ribs.

10. The combination of claim 9 wherein said dewatering means further includes dewatering deflectors situated within said covering wire loop and duct means for connecting said deflectors to a suction system.

11. The combination of claim 8 wherein said second forming roller consists of a combined forming and suction roller having a suction sector over which the joint run of said carrying and covering wires is curved towards the loop of said carrying wire.

12. The combination of claim 8 wherein said radius of said first curved configuration has a length in the range of between about 10 meters to 20 meters.

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Exhibit 8

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F-9175 PCT (14-228)

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12-3-92

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of
R. Buck, D. Egelhop et al.
Serial No.: 07/773,965
Filed: November 12, 1991
For: TWIN-WIRE FORMER

Date: November 19, 1992
Group Art Unit: 1303
Examiner: Hastings, K.

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

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GROUP 130

AMENDMENT

Sir:

In response to the Office Action mailed September 14, 1992, please amend the above-identified application as follows:

IN THE CLAIMS:

Cancel claims 17 and 22.

Please amend the claims as follows:

13. (Amended) A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

the twin wire zone having a first section at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the

headbox to the wedge shaped entrance slot of the first section of the twin wire zone [the slot being adapted for receiving suspension directly from a head box]; a curved drainage element in the first section, the curved drainage element being curved along the path of the belts through the twin wire zone, the curved drainage element being engaged by one of the wire belts, for curving the path of the belts around the curved drainage element after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, at least two [one] first drainage strips are [strip which is] positioned at the side of the first wire belt away from the second wire belt and are [is] for contacting the first wire belt; in the second section, at least one second drainage strip which is positioned at the side of the second wire belt away from the first wire belt and is for contacting the second wire belt; one of the first and second strips being shifted in position along the path of the wire belts with respect to the other of the first and second strips; first support means for resiliently supporting [at least one of] the first [and second] drainage strips against the respective wire belt that that strip contacts;

second support means supporting the at least one second drainage strip rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a stationary drainage element in the third section, for being engaged by one of the wire belts as the wire belts travel over the stationary drainage element.

14. (Amended) The twin wire former of claim 13, wherein [in the second section of the twin wire zone, there are at least two of the first drainage strips at the first wire belt and spaced from each other along the path of the wire belts and] there are at least two of the second drainage strips at the

B₁ second wire belt [and] spaced from each other along the path of the wire belts, with the first drainage strips being shifted along the wire belt path with respect to the second drainage strips such that the first and second drainage strips alternate along the path of the wire belts; and wherein

the second support means supports the at least two second drainage strips rigidly against the second wire belt [at least one of the first drainage strips being resiliently supported against the first wire belt].

B₂ 21. (Amended) The twin wire former of claim 14¹³ wherein the first and second support means comprise [further comprising] a respective individual support body supporting each of the first and second drainage strips individually and means further supporting the respective support body of ^{at least} at least one of the first and second strips for enabling said one strip [those strips] to be moved transverse to the direction of the path of the wire belts.

Claim 27, line 3, change "second" to --section--.

REMARKS

Claims 13, 14, 21 and 27 have been amended to address the Examiner's rejection thereof under 35 U.S.C. §112. Claims 17 and 22 have been cancelled. Reconsideration of the application in view of the foregoing amendments and the following remarks is respectfully requested.

Claims 13-16, 20, 21 and 23-33 stand rejected under 35 U.S.C. §112, first paragraph. As noted, claims 13, 14, 21 and 27 have been amended and it is believed that the amendments have addressed all of the areas noted by the Examiner with one exception. Claim 13 has not been amended to require at least two rigidly supported strips. While the Examiner is correct that applicants' specification indicates on page 15 that the minimum number of flexibly supported strips is 2, it is also indicated on page 14, lines 29-31 that it is possible to make the number of

flexibly supported strips equal to or greater by one than the number of rigidly supported strips. Thus, while two flexibly supported strips are required, only one rigidly supported strip is required. In view of the foregoing, it is believed that the rejection under 35 U.S.C. §112, first paragraph has been overcome and it is respectfully requested that this rejection be withdrawn.

Claims 13-16 and 28-30 stand rejected under 35 U.S.C. §102(b) as being anticipated by, or in the alternative, under 35 U.S.C. §103 as being obvious over German DE 3138133 ("DE '133"). Applicants respectfully traverse such rejection.

Claim 13, as amended, is now positively directed to a twin-wire former which includes a head box having an outlet placed and directed for delivering fiber suspension to the wedge shaped entrance slot of a first section of a twin wire zone of the former and positively recites that neither wire belt defines a single wire for pre-drainage zone.

In contrast, DE '133 includes, as noted on page 5, line 27 of applicants' specification, and as recognized by the Examiner, a single wire pre-drainage zone position in front of the twin-wire zone. As a result of the pre-drainage zone, forming of the web starts initially only in the lower layer of the fiber suspension while the upper layer remains liquid with the strong tendency to flocculation, and the resultant flakes cannot be broken up again to the desired extent in the following twin-wire zone.

While the Examiner recognizes that DE '133 has a single wire predrainage zone, the Examiner contends that the elimination thereof in DE '133 would be obvious. However, no support is offered for such assertion and applicants assert that such is not the case. Accordingly, it is respectfully submitted that DE '133 neither discloses nor suggests the twin-wire former set forth in claim 13 and that claim 13 is therefore patentable over DE '133.

Claims 14-16 and 28-30 are dependent either directly or indirectly from claim 13 and are therefore similarly patentable. In addition, these claims recite features such as the thickness

and spacing of the drainage strips, which are neither disclosed nor suggested by DE '133. In view of the foregoing, it is respectfully requested that the rejection of claims 13-16 and 28-30 on the basis of DE '133 be withdrawn.

Claims 13-16, 18-21 and 23-33 stand rejected under 35 U.S.C. §103 as being unpatentable over Tissari (U.S. Patent No. 4,609,435) or Koski (U.S. Patent No. 4,925,531) in view of DE '133. Applicants respectfully traverse such rejections.

As noted by the Examiner, both Tissari and Koski are each deficient in not disclosing resilient support. Thus, in Tissari, neither the strips 45 or 44 are resiliently supported and in the case of Koski neither of the deflectors 17 or 37 are resiliently supported.

The Examiner alleges that the artisan is well aware of the option and advantages of resiliently supporting the watering ribs/strips as evidenced by DE '133. However, as noted on page 4, line 18, et seq., of applicants' specification, applicants are not claiming that any of the specific features are new. What applicants are claiming however is that they are the first to have combined these features as specified in claim 1 and that such combination provides unforeseeable improvements in the resultant product, to wit, the combination of claim 1 results in extremely high increase in the quality of the finished fiber web while at the same time being insensitive to changes in the amount of suspension fed and to changes in the drainage behavior of the fiber suspension. Thus it is possible to obtain both a high increase in quality with respect to the formation and also good values with regard to the retention of fillers and fines. In contrast, in the twin-wire formers of the prior art, it is found that there is a strong reduction in the retention of fillers and fines. Neither Tissari nor Koski disclose or suggest that the dewatering ribs/strips employed therein should have one set which is resiliently mounted and the other set rigidly mounted. In view of the foregoing, applicants respectfully submit that claim 13 is patentable over Tissari, Koski and DE '133, either considered singly or in combination.

Claims 14-16, 18-21 and 23-33 are dependent either directly or indirectly from claim 13 and are therefore believed similarly allowable. In addition, these claims define additional features of the invention not disclosed or suggested in the reference, and in particular none of the references disclose the thickness and spacing of the drainage strips as claimed in claim 16.

With respect to the citation by the Examiner of Schiel, et al. (U.S. Patent No. 5,078,835), applicants respectfully point out that Schiel's effective date of reference is its U.S. filing date of June 6, 1991. Applicants' priority date, however, is August 22, 1989 and accordingly Schiel et al. is not prior art against this application.

With respect to the rejection of claim 22 as being unpatentable over DE '133, and further in view of Armstrong et al. (U.S. Patent No. 4,425,187), claim 22 has been cancelled and so this rejection is deemed moot. Applicant also wishes to point out that there is only one headbox employed in applicants' twin-wire former.

In view of the foregoing, this application is now believed to be in condition for allowance, which action is respectfully requested.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on November 19, 1992:

Martin Pfeffer
 Name of applicant, assignee or
 Registered Representative
 Signature
 November 19, 1992
 Date of Signature

Respectfully submitted,

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123-92
P-9175 PCT (14-228)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

R. Buck, D. Egelhop et al.

Date: November 19, 1992

Serial No.: 07/773,965

Group Art Unit: 1303

Filed: November 12, 1991

Examiner: Hastings, K.

For: TWIN-WIRE FORMER

AMENDMENT TRANSMITTAL LETTER - FEE COMPUTATION

Hon. Commissioner of Patents and Trademarks
Washington, D.C. 20231

Transmitted herewith is an amendment in the above-identified application.

"Small Entity" status (37 C.F.R. §1.9 & §1.27) established
previously by enclosed verified statement.OFPS Check No. _____, which includes the fee of \$-0- calculated
below, is attached.

NO. CLAIMS AFTER AMENDMENT	HIGHEST NO. PREVIOUSLY PAID FOR	EXTRA PRESENT	RATE	ADDIT. FEE
TOTAL 21	MINUS 21	* =	x (\$11 SE or \$22)	\$0
INDEP. 3	MINUS 3	** =	x (\$37 SE or \$74)	\$0
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				x (\$115 SE or \$230)
* not less than 20 ** not less than 3				TOTAL \$0

In the event the actual fee is greater than the payment submitted or is inadvertently not enclosed or if any additional fee during the prosecution of this application is not paid, the Patent Office is authorized to charge the underpayment to Deposit Account No. 15-0700. A duplicate of this sheet is enclosed.

If this communication is filed after the shortened statutory time period had elapsed and no separate Petition is enclosed, the Commissioner of Patents and Trademarks is petitioned, under 37 C.F.R. §1.136(a), to extend the time for filing a response to the outstanding Office Action by the number of months which will avoid abandonment under 37 C.F.R. §1.135. The fee under 37 C.F.R. § 1.17 should be charged to our Deposit Account No. 15-0700. A duplicate copy of this sheet is enclosed.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on November 19, 1992.

Martin Pfeffer

Name of Registered Representative

Signature

November 19, 1992

Date of Signature

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Respectfully submitted,

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